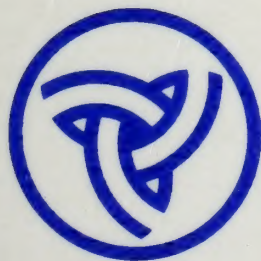


Illinois Transportation Law



**Illinois Department
of Transportation**

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CHAMPAIGN

~~DOCUMENTS~~



Illinois Department of Transportation

2300 South Dirksen Parkway / Springfield, Illinois/62764

April 19, 1979

To Whom It May Concern:

Pursuant to passage of P.A. 80-351, the Hazardous Materials Transportation Act, the Illinois Department of Transportation has adopted regulations for the transportation of hazardous materials over Illinois highways. Our records indicate that you were sent a copy of the proposed regulations in March 1978.

In an effort to make the adopted regulations available for viewing by as many people as possible we are requesting that you receive and display the enclosed document in place of the proposed regulations you have now. Then when we receive an inquiry, we can refer them to your library.

As the regulations change, we will send you updated copies. If you have any questions or need further assistance in this matter, please do not hesitate to contact me at 217/785-3064.


Sincerely,

A handwritten signature in cursive script that reads "Marvin G. Hardin".

Marvin G. Hardin, Chief
Hazardous Materials Section

Attachment

MGH:sll



Illinois Hazardous Material Transportation Regulations

First Edition, February 1, 1979



Illinois Department of Transportation

ILLINOIS DEPARTMENT OF TRANSPORTATION
Division of Traffic Safety

Docket No. HM78-001

Illinois Hazardous Materials Transportation Act

NOTICE OF RULES ADOPTED

Agency: Illinois Department of Transportation

Title or Name of Rule and Action Taken by Agency: Hazardous Materials Regulations
- Notice of Rules Adopted

Statutory Authority: Illinois Revised Statutes, Chapter 95 1/2, Paragraph 700-4(a)
and 700-9(a)

Effective Date of Rule: February 1, 1979

Date Filed in Agency's Principal Office: Thursday, January 18, 1979

Date Notice Proposal Published in Register: Original proposal was filed on May 12, 1978. A proposed amendment to the proposed regulations was filed July 21, 1978.

Has the Joint Committee on Administrative Rules issued a Statement of Objections to this Rule? No.

Difference between proposal and final version: On May 12, 1978, proposed regulations for implementing the Illinois Hazardous Materials Transportation Act (Public Act 80-351) were published in the Illinois Register. By these regulations the Illinois Department of Transportation proposed to adopt certain portions of the hazardous materials regulations of the U. S. Department of Transportation and certain portions of the Federal Motor Carrier Safety Regulations as the initial regulations for governing the transportation of hazardous materials on the highways of the State of Illinois. Interested persons were invited to participate in this rulemaking by submitting written data, views, arguments or comments to the Department by June 1, 1978. This date was extended to July 5, 1978, to allow those receiving late notice of the proposed rulemaking sufficient time to respond. In addition, public hearings were held on June 6 and 7, 1978, in Chicago, and June 13, 1978, in Springfield to afford interested persons an opportunity to be heard on the proposed rulemaking.

On July 21, 1978, a proposed amendment to the Department's proposed hazardous materials regulations was published in the Illinois Register. By that proposal, the Department would add Section 171.6. This would except from certain provisions of the Department's proposed regulations certain hazardous materials intended solely for agricultural usage when transported from retailer to a farm, or between final end users from farm-to-farm. Although this agricultural exception was referred to in the Notice of Proposed Rulemaking that had been earlier published in the May 12, 1978 , edition of the Illinois Register, the proposed text of the exception was inadvertently omitted. Interested persons were invited to submit data, views, arguments, or comments to the Department by August 25, 1978.

The public docket on this rulemaking contains correspondence, submissions, and testimony from 12 commentators, none of which concerned the agricultural exception. The formal statements of support for this regulatory program were made personally to the docket by State Senator Samuel C. Maragos and by State Representative John Dunn. Although some reservations or concerns were expressed by commentators about certain specific points in the proposed regulations, as explained below, the general tone taken by the commentators was positive and supportive of the State's intentions. This has also been true of the comments that were received through letters and telephone calls to the Department. Comments were received both from individuals and from representatives of industries and trade organizations. Some comments were adopted in whole or in part, and some were rejected. In addition, the Department again reviewed its proposed regulations for both editorial and substantive changes. The significant issues and changes are discussed in the following paragraphs.

The Department is adopting the proposed regulations as a final rule with few changes. There were numerous editorial changes, such as corrections of typographical errors, slight alterations in format, and the elimination of superfluous footnotes. Changes of a more substantive nature concern the deletion of most of the regulatory language regarding air, rail and water modes, substitution in the text of the phrase "by highway in Illinois" for the phrase "in commerce", and the addition of language which clarified certain critical points. Such changes were required to make clear that the jurisdiction of the Department and the scope of the adopted regulations extend only to the transportation of hazardous materials by highway in Illinois, and to the handling and storage operations incident to such transportation. However, regulations apply also to the highway portion of an intermodal shipment of hazardous materials. Thus, the Department may properly regulate the transportation by highway of hazardous materials which move into, through, or out of Illinois by air, rail or water. For this reason, some reference to air, rail and water modes have been retained in these adopted regulations, particularly in the hazardous materials table in Section 172.101. The intermodal references in the hazardous materials table permit a shipper of hazardous materials who may be subject to federal regulation to better comprehend and coordinate the requirements of the Illinois and Federal regulations and, in some cases, to note the distinctions between the two.

A significant change in this adopted version of the regulations is the inclusion of Section 171.6, which provides specific exception from certain parts of the regulations when certain quantities and types of hazardous materials are transported in futherance of husbandry in Illinois. As noted earlier, this agricultural exception was the subject of a separate rulemaking. It was included in the regulations in response to Section 2 of the Enabling Act, which expressed the intent of the Legislature to not "regulate the

movement of hazardous materials in such quantities that would not pose a substantial danger to the public health and safety, such as fuels, fertilizer and agriculture chemicals while being used in a normal farming operation or in transit to the farm." The provision was developed through the efforts of an ad hoc committee of Department staff, representatives of the State agricultural community and state officials. It reflects the State's concern that farmers might be unduly burdened by the regulations unless specific relief is granted. One commentator pointed out that farmers and fertilizer dealers located near state lines who customarily buy the commodities covered by the agricultural exception in another state and transport them into Illinois will not benefit from the exception. Such trips would qualify as interstate commerce. It is true that such transportation would be outside the scope of these regulations, and that the agricultural exception will not apply in such cases. However, in cases which seem to the Department justified, the Department will assist in preparing a petition to the U. S. Department of Transportation for an exemption that would allow the petitioner(s) to make specific hauls of the commodities intended to be excepted, across a state line, complying only with the Illinois regulations.

Several persons commented about the provision of Section 107.307, which concerns the inspection of premises. These commentators were concerned that the proposed inspection provision would have permitted unlimited and unrestrained inspections by the Illinois State Police (and presumably other authorized persons) of shipper or carrier premises. Subsequent to the date when the Department issued its proposed regulations, the United States Supreme Court issued its decision in Marshall V. Barlow's Inc., invalidating the provision of the Occupational Safety and Health Act which authorized inspections of business premises without a warrant or its equivalent. The Court discussed the basic requirements for governmental inspections of commercial premises. The Department has rewritten Section 107.307 to conform to the requirements outlined by the Court. Revised Section 107.307 will alleviate the primary concern raised by the commentators, and will provide a legally permissible inspection procedure. One commentator suggested that inspections be limited only to loading areas. The Department believes that this suggestion would unduly restrain it in its regulation of hazardous materials. The preparation of hazardous materials shipment for safe transportation involves a number of operations other than the proper loading of the vehicle used to transport it. Therefore, internal packaging, marking and labeling, interim storage and handling could be of greater concern, in some cases, than the loading operation itself. Thus, the Department requires inspection access to operations that are carried out elsewhere than the loading area. While the Department requires wider inspection access than this commentator suggested, it is nonetheless its intention to limit its demands for such access strictly according to the needs of a given situation.

A representative of the fertilizer and chemical industry requested that the Department permit the continued use of anhydrous ammonia cargo tanks having a design pressure of 250 p.s.i.g. The Department's proposed regulations would have required that such cargo tanks have a design pressure of 265 p.s.i.g. It was the position of the industry representative that adoption of this higher standard would result in great economic hardship to Illinois business and would also affect Illinois agriculture, which is very dependent on the distribution of anhydrous ammonia. Although the industry representative did not support his contention with substantive data, the Department's own review of the issue revealed that some negative economic effects could be experienced by the smaller anhydrous ammonia distributors as a result of this requirement. However, that effect would not be of a magnitude to warrant reducing the 265 p.s.i.g. requirement to

250 p.s.i.g. The Department therefore decided to allow the older 250 p.s.i.g. tanks to be phased out. That decision was based on a review of the technical specifications of the tanks themselves, and on discussions with various tank design engineers, federal officials, and safety experts. Structurally, the 250 p.s.i.g. tank is nearly identical to the 265 p.s.i.g. tank. It was the consensus of those contacted that there would be no safety problem by the continued use of the 250 p.s.i.g. tanks; but that the Department should set a date for phase out of the older design tanks. This would allow anhydrous ammonia distributors to recover their investment while phasing in the newer tanks which incorporate the latest safety design features, including a minimum design pressure of 265 p.s.i.g. These regulations, therefore, provide that tanks having a design pressure of 250 p.s.i.g. which were in anhydrous ammonia service in Illinois prior to February 1, 1979, may continue to be used in such service. No cargo tank that has not been in anhydrous ammonia service in Illinois before February 1, 1979, may be placed in such service in Illinois after that date unless it meets all requirements of Section 178.337 of the adopted regulations, including a minimum design pressure of 265 p.s.i.g. The appropriate provisions of these regulations have been revised accordingly.

The Department's Bureau of Traffic inquired whether the shipping paper requirements of the proposed regulations would apply to the Department's own highway paint striper or other special purpose vehicles. A review of this issue revealed a much broader problem in this regard than was anticipated, because many vehicles are used exclusively for one type of commodity, such as paint striper trucks or LP-Gas delivery trucks. Preparation of shipping papers for each delivery trip would be excessive and of limited or no benefit to safety. To alleviate this problem, the Department has included provisions in these regulations for permanent-type shipping papers (See Section 172.205). The effect of this provision is to grant limited relief from the shipping paper requirements for cargo tank operation. The permanent-type shipping paper is prepared once and requires little or no change day-to-day. The permanent shipping paper may be used by private, contract, or common carriers and should prove beneficial to those involved in cargo tank operations; where the same commodities are carried over virtually the same route in the same truck.

Proposed Sections 171.15 and 171.16 provided requirements for immediate notifications of accidents/incidents, and follow-up reporting. The requirements of these sections have been deleted from the adopted regulations because they duplicated current regulations of the State Emergency Services and Disaster Agency. Since the Department has neither the statutory authority nor staff to function in an emergency response capacity, the requirement for immediate notification is unnecessary.

Proposed Section 179 addressed a type of railroad tank car, commonly called "Ton tanks," which could be moved from rail to truck. This section has been revised to read "Tank Car Tanks" and all references to the tank throughout these regulations have been revised to reflect that change in nomenclature. It was not the Department's intent to regulate rail transportation; however, the Department will regulate the movement of these tanks in the highway phase of an intermodal movement.

Two commentators objected to the requirement in Section 107.308(c) that the State Police, in issuing a Notice of Apparent Violation, obtain a signed receipt from the person receiving the notice, or note that person's refusal to sign the notice. The commentators stated that this requirement was designed to intimidate companies into signing away their rights.

It was never the intent of the Department to have the signature requirement be anything other than evidence of receipt of the notice; however, the Department agrees that Section 107.308(c), as proposed, could have been misinterpreted. This requirement in Section 107.308(c) has, therefore, been deleted and a notation has been added to the Notice of Apparent Violation form which reads "Signature acknowledges receipt of the form, but does not admit or deny violation."

Several commentators took issue with the proposed requirement of Appendix A to Part 107 under Subchapter B of the regulations. Appendix A concerns marking of packages with the notation "IDOT-E" when the movement of hazardous materials is made under an exemption pursuant to Section 107.102. As proposed, the regulations would have required dual marking of packages which are shipped under an exemption issued by the Federal Government. The regulations have been revised to provide that movement under a federal exemption shall be considered as a valid movement under exemption from the Illinois regulations, without the addition of the "IDOT-E" notation. When the Department issues an exemption all the provisions of the regulations, including marking and shipping paper notation, will apply.

One commentator objected to the use in Section 107.308(b)(2) of the word "equipment" pointing out that the term "equipment" was exceptionally broad and undefined and could therefore be applied to result in persons such as fork lift operators in warehouses being cited for violations not associated with transportation. The department has therefore revised Section 107.308(b)(2) by substituting the words "motor vehicle" or "vehicle" for the word "equipment". The Department intends, however, to regulate each phase of the transportation process including storage and handling incidental to highway transportation. Therefore, the Department has added to these adopted regulations a new Section 107.308(b)(3) to cover the case in which an individual person is observed to be knowingly violating, or in which there is evidence that the person knowingly violated, the regulations.

One agricultural services industry representative suggested striking all of Part 178, which concerns packaging of hazardous materials, because the federal agencies are in dispute over container specifications. The representative stated that "it would be unwise at this time to adopt container specifications for the State of Illinois which are uncertain and perhaps would be illegal under federal regulations." The Department has, for some time, followed the activities of the United States Department of Transportation and the United States Environmental Protection Agency in their hearings on the Resource Conservation and Recovery Act. It does not appear that U.S.E.P.A. is so much interested in "containers" as it is in "containment." The Department believes deletion of the container specifications in Part 178 would be premature.

A few persons objected to the Department's proposal to adopt the Federal Motor Carrier Safety Regulations Parts 390-397 as a whole. It was not the intent of the Department to adopt any portion of Parts 390-396 at this time. The only portion of Part 397 that was proposed for adoption pertains to the parking and driving of vehicles used to transport hazardous materials. Because of an oversight, the Department failed to delete from the proposed regulations cross-references to the other Parts, thereby implying their adoption. These cross-references have been deleted.

Several persons testifying on the proposed regulations expressed concern regarding the proper and sufficient training of enforcement personnel. One person suggested deletion of Section 107.301, concerning the responsibility for enforcement. Instead, they

proposed inserting specific training requirements. The Department understands the concern of the regulated industry. The history of the regulatory processes at the State and Federal level reflects the recurrent problem of training competent enforcement personnel. But it is the Department's awareness of the problem which underlays the wording of Section 107.301, which specifically restricts enforcement of the regulations to agencies with which the Secretary concludes an agreement. It is not the Department's intent to allow arbitrary enforcement of the regulations by any agency. The complexity of these regulations requires demonstrated expertise in their use and interpretation. The Department's method of assuring such expertise is the interagency agreement, one specification of which will contain the qualifications and training of enforcement personnel. But more significant to the concerns of the various industries and associations is the fact that while "enforcement" may be delegated to selected agencies, the actual (civil) penalty assessment is reserved to the Department. Section 107.310 directs the Department to review the notice of apparent violation and determine whether any further administrative action is required.

Concern was also expressed regarding the differences between the penalty provisions in the federal and state regulations. Specifically, the Department was asked "Who has the right of prosecution when non-compliance is discovered by the Illinois State Police?" First, it must be pointed out that the penalty provisions have been established by statute and not by regulation. The penalty provision that will apply will depend upon which regulation has been violated, and which regulations are sought to be enforced. If the violation occurs in a movement of hazardous materials in intrastate commerce, the state regulations will apply and the right of prosecution will normally lie solely with the State of Illinois. If the violation is connected with an interstate shipment, the right of prosecution lies with the Federal Government and also with the State of Illinois, if the State regulations cover the violation. These general considerations aside, a determination of where the right of prosecution lies can only be made on a case-by-case basis, because the factual circumstances of each case will often vary significantly.

Several industry representatives indicated concern over the obvious conflict between other Illinois statutes and the Department's proposed regulations. Specific examples cited were the definitions of flammable liquid, (defined by Illinois Vehicle code as volatile liquids with a flashpoint of 73° F. or lower and by the regulations we proposed as having a flashpoint of 100° F. or lower) and placarding requirements (rectangular and reflective by statute; diamond shaped and color coded by the proposed rule). The Department was aware of these and other conflicts at the time its regulations were proposed. In some instances, our regulations will result in adoption of more stringent requirements; in other cases more lenient. Corrective legislation is being drafted which will eliminate the ambiguities. The Department is also working with the other state regulatory agencies to identify areas of conflict and develop cooperation arrangements or enforcement. In the interim, in case of conflict, the provisions of these regulations will prevail.

Several commentators expressed concern about the Department keeping the regulations updated. The Department intends to continually monitor the federal regulation of the transportation of hazardous materials in order to ensure that the Department's regulations remain consistent with them. The Department will also continue to monitor changes which are occurring in related technology. The Department intends to issue corrective supplements to its regulations (through prescribed rulemaking procedures) every six months. Every two years a revised edition of the regulations will be printed

incorporating each change which has been made. It would be very burdensome for the Department to initiate a rulemaking to change its regulations every time the federal regulations are changed and even more burdensome for industry to follow and comply with those changes. Therefore, the Department will notify all interested persons about changes which occur in the federal regulations which will later be reflected in the Illinois regulations. Until such time as the Department is able to formally change its regulations, the Department will encourage voluntary compliance with the changes. The Department will not enforce any provision of these regulations which it determines to have been invalidated by a change in the applicable federal regulations or law.

One trucking industry representative requested that the Department reconsider its position regarding the conditions under which the hazardous materials regulations apply to a shipment or carrier. As presently proposed, the regulations will apply only if placarding of the transporting vehicle or container is required. In that event, all of the other requirements for shipping papers, labeling, etc., would apply. The State's objective is to avoid over regulation of shipments, which is certain to occur if we do not make this provision.

In counterpoint the commentator noted that some common carriers might pick up incremental hazardous materials loads on the assumption that they would stay below the placarding level; but then be offered an additional shipment that would push them over the point where the full scope of the regulations would apply. Obviously, the carrier could not retrace his steps and require compliance of the loads already picked up. The only alternative would be to refuse that last shipment. In this connection, it is important to note there are a number of common carriers who are parties to the Illinois Commerce Commission Hazardous Materials Tariff (or Dangerous Articles Tariff as it was formerly known) which apparently would effectively eliminate such carriers from the body of those who might be affected in this way.

Whatever the extent of the problem, its avoidance seems to lie primarily with carriers surveying the freight they now receive, and receive in future, to spot any patterns of hazardous materials that would combine to an "overload." Carriers could then advise shippers in advance that full compliance with the hazardous materials regulations would be required to insure against possible refusal of the freight.

The Department has decided to adopt that provision of the proposed regulation concerning applicability. In other words, when the shipment is of a type and quantity to require placarding of the container or transporting vehicle, these regulations apply.

Will this rulemaking replace an emergency rule currently in effect: No.

Summary and Purpose of Rule: The Department of Transportation has adopted these regulations for the purpose of implementing the Department's administration and enforcement of the Illinois Hazardous Materials Transportation Act (Public Act 80-351). A detailed discussion of the subject matters and issues involved is set forth in the Department's Notices of Proposed Rulemaking published in the May 12 and July 21, 1978 Illinois Registers. These regulations reflect the results of an extensive and continuing study by the Department of the scope and nature of the problem of the transportation of hazardous materials by highway in Illinois.

The primary goal of these regulations is to reduce the risk to life and property inherent in the transportation of hazardous materials in this State by keeping such risk to a minimum consistent with technical feasibility and economic reasonableness. The regulations implement the intent of the General Assembly not to regulate the movement of hazardous materials in quantities which pose little or no substantial danger to the public health. The regulations apply at the level where the greatest exposure to accidents and incidents have occurred — principally in bulk shipments of hazardous materials.

Except for shipments of nuclear substances, the adopted regulations will apply only if a substance, either because of its hazard classification or the quantity being shipped, requires that the vehicle transporting it be placarded. The Illinois criteria requiring the placarding of a vehicle will be identical to that currently specified by the federal regulations, with exceptions for specified quantities of fuels, fertilizers and pesticides intended to be used in a normal farming operation which are being shipped from the retailer to a farm or between farms. In the case of nuclear substances, the pertinent regulations will apply regardless of the quantity being shipped.

If a shipment meets the criteria that would require the vehicle transporting it to be placarded, then all applicable parts of the regulations concerning marking, labeling, loading, storing, shipping papers, specification of containers and safe handling would apply. If the nature of the shipment is such that placarding the vehicle is not required then none of the regulations would apply.

However, no person may offer, accept, or transport a hazardous material by highway in Illinois, regardless of the quantity of hazardous material in the shipment or on the vehicle if there is a substantial likelihood that the offer, acceptance, or transportation of that hazardous material is likely to cause death, serious illness, or severe personal injury until such time as the hazard has been completely abated.

Responsibility for enforcement of the regulations will be exercised by the Department of Transportation, the Illinois State Police and the Department of Public Health with respect to the transportation of shipments of radioactive materials, in accordance with delegation of authority from the Secretary of the Department of Transportation.

The full text of Adopted Rule is as follows:

CHAPTER I -- DIVISION OF TRAFFIC SAFETY
HAZARDOUS MATERIALS SECTION
ILLINOIS DEPARTMENT OF TRANSPORTATION

(Parts 100-179 & Part 397)
 REGULATION OF THE
 TRANSPORTATION OF HAZARDOUS MATERIALS

SUBCHAPTER A — OFFICE OF THE DIRECTOR,

DIVISION OF TRAFFIC SAFETY

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SUBCHAPTER B — HAZARDOUS MATERIALS PROCEDURES

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**SUBCHAPTER D — MOTOR CARRIER SAFETY REGULATIONS FOR
TRANSPORTATION OF HAZARDOUS MATERIALS**

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Authority: Illinois Revised Statutes, Chapter 95 1/2, Paragraphs 700-4(a) and 700-9(a).

SUBCHAPTER A-OFFICE OF THE DIRECTOR, DIVISION OF TRAFFIC SAFETY

Parts 100-101 (Reserved)

Part 102-Rulemaking Procedures

Subpart A-General

Sec.

- 102.1 Scope
- 102.3 Definitions
- 102.5 Regulatory dockets
- 102.7 Records
- 102.9 Where to file petitions

Subpart B

Procedures for Adoption of Rules

- 102.11 General
- 102.12-102.30 (Reserved)
- 102.31 Petitions for rule making.

Authority: Illinois Revised Statutes, Chapter 95 1/2, Paragraphs 700-4(a) and 700-9(a).

Subpart A-General

102.1 Scope

This Part designates the procedures which govern the issuance, amendment and repeal of regulations of the Division of Traffic Safety of the Illinois Department of Transportation concerning the transportation of hazardous materials

102.3 Definitions

For the purpose of this Part, "Director" means the Director of the Division of Traffic Safety.

102.5 Regulatory dockets

(a) Information and data relating to rulemaking actions, including notices of proposed rulemaking, comments received in response to notices, records of additional rulemaking proceedings, and final regulations are maintained by the Division of Traffic Safety, Illinois Department of Transportation, 2300 South Dirksen Parkway, Springfield, Illinois 62764.

(b) Any person may examine and copy any docketed material at the offices of the Division of Traffic Safety during regular business hours after the docket is established, except material which the Director determines should be withheld from public disclosure under applicable

provisions of any statute administered by the Director or which are deemed confidential by State or Federal Statute or which the Director determines to constitute trade secrets.

102.7 Records

Records of the Division of Traffic Safety relating to rulemaking proceedings are available for inspection as provided in Section 4(a) 2 of the Illinois Administrative Procedures Act.

102.9 Where to file petitions

Any petition filed by any person relating to any proposed or existing regulation concerning the transportation of hazardous materials must be submitted to: Director, Division of Traffic Safety, Illinois Department of Transportation, 2300 South Dirksen Parkway, Springfield, Illinois 62764.

Subpart B-Procedures for Adoption of Rules

102.11 General

Except as expressly provided in this Subchapter, the rulemaking procedures set forth in the Department's Rulemaking Procedures shall govern the issuance, amendment and repeal of regulations of the Division of Traffic Safety of the Illinois Department of Transportation concerning the transportation of hazardous materials.

102.12-102.30 (Reserved)

102.31 Petitions for rule making.

(a) Any interested person may petition the Director to establish, amend, or repeal a regulation.

(b) Each petition filed under this section must—

(1) Set forth the text or substance of the regulation or amendment proposed, or specify the rule that the petitioner seeks to have repealed, as the case may be;

(2) Explain the interest of the petitioner in the action requested; and

(3) Contain any information and arguments available to the petitioner to support the action sought.

Parts 103-105 (Reserved)

SUBCHAPTER B-HAZARDOUS MATERIALS PROCEDURES

Part 106 (Reserved)

Part 107 Procedures

Subpart A-General Provisions

Sec.

- 107.1 Purpose and scope
- 107.3 Definitions
- 107.5 Request for confidential treatment
- 107.7 (Reserved)
- 107.9 (Reserved)
- 107.11 Service
- 107.13 Subpoenas

Subpart B-Exemptions

- 107.101 Purpose and scope
- 107.102 Persons holding federal exemptions
- 107.103 Application for exemptions for transportation not governed by federal Hazardous Materials Regulations
- 107.105 Application for renewal
- 107.107 Initial application review
- 107.109 Processing of application
- 107.111 Party-to an exemption
- 107.113 (Reserved)
- 107.115 (Reserved)
- 107.117 Withdrawal
- 107.119 Termination
- 107.121 Appeal
- 107.123 Availability for public inspection

Subpart C-(Reserved)

Subpart D-Enforcement

- 107.301 Responsibility for enforcement
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- 107.305 Investigations
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- 107.308 Notice of apparent violation
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- 107.311 Warning letter
- 107.312 (Reserved)

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- 107.313 Civil penalties generally
- 107.314 Maximum penalties
- 107.315 Notice of probable violation

- 107.316 Reply
- 107.317 Payment of penalty
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- 107.320 Presiding officer's decision
- 107.321 Assessment considerations
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- 107.331 Compliance orders generally
- 107.333 Notice of probable violation
- 107.334 Reply
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- 107.336 Hearing
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- 107.341 Injunctions generally
- 107.343 Imminent hazards

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- 107.371 Criminal penalties generally
- 107.373 Referral for prosecution

Appendix A

Standard conditions applicable to exemptions.

Authority: Illinois Revised Statutes, Chapter 95 1/2, Paragraphs 700-4(a) and 700-9(a).

Subpart A-General Provisions

107.1 Purpose and scope.

This Part defines certain terms and prescribes procedures that are applicable to each proceeding described in this Part that are utilized by the Department in carrying out its duties under the laws pertaining to the transportation of hazardous materials.

107.3 Definitions

As used in this Part:

"Act" means the Illinois Hazardous Materials Transportation Act.

"Department" means the Illinois Department of Transportation.

"Director" means the Director of the Division of Traffic Safety.

"Division" means the Division of Traffic Safety, Hazardous Materials Section.

"Person" includes a corporation, company, association, firm, partnership, society, and joint stock company, joint venture, sole proprietorship, as well as any officer, director, owner, or duly authorized representative of any such unit or an individual, or any governmental entity.

"Respondent" means a person upon whom the Department has served a notice of probable violation.

"Secretary" means the Secretary of the Illinois Department of Transportation.

"State" means the State of Illinois.

"State Police" includes any individual officer of the State Police.

107.5 Request for confidential treatment

(a) If any person filing a document with the Division claims that some or all the information contained in the document should be exempt from public disclosure, and if that person requests the Division not to disclose the information, that person shall file together with the document a second copy of the document from which has been deleted the information for which confidential treatment is claimed. The person shall indicate in the original document that it is confidential or contains confidential information and shall file a statement specifying the justification for which confidential treatment is claimed. If the person states that the information constitutes trade secrets or commercial or financial information, that person must include a statement as to why the information is privileged or confidential.

(b) The Division retains the right to make its own determination with regard to any claim of confidentiality. The determination of confidentiality will be based upon one or more of the following: (1) the information submitted to the Division under paragraph (a); (2) The applicable provisions of any State or Federal statute which requires the information to be kept confidential; (3) whether such information constitutes trade secrets or commercial or financial information; (4) whether the information should be kept confidential in view of ongoing compliance actions; (5) whether release of the information could commercially or personally harm any person. Notice of a decision by the Division to deny the claim, in whole or in part, and an opportunity to respond shall be

given to any person claiming confidentiality of information, no less than five days prior to its public disclosure.

107.7 (Reserved)

107.9 (Reserved)

107.11 Service.

(a) Each order, notice, or other document required to be served under this Part shall be served personally or by registered or certified mail, except as otherwise provided.

(b) Service upon a person's duly authorized representative constitutes service upon that person.

(c) Service by registered or certified mail is complete upon mailing. An official United States Postal Service receipt from the registered or certified mailing constitutes prima facie evidence of service.

107.13 Subpoenas.

(a) The Director, or any individual whom he has designated to preside over a hearing convened in accordance with this Part, may sign and issue subpoenas either on his own initiative or, upon the request of any person participating in that proceeding where that person makes an adequate showing that the information sought will materially advance the proceeding.

(b) A subpoena may require the attendance of a witness or the production of relevant documentary or other tangible evidence in the possession or under the control of the person served, or both.

(c) Service of a subpoena upon the person named therein shall be made by delivering a copy of the subpoena to such person. Delivery of a copy of a subpoena to a natural person may be made by handing it to the person, leaving it at his or her office with the person in charge thereof, leaving it at his dwelling place or usual place of abode with some person of suitable age and discretion then residing therein, or by mailing it by registered or certified mail to the person at the person's last known address. When the person to be served is not a natural person, delivery of a copy of the subpoena may be effected by handing it to a registered agent for service, or to any officer, director, or agent in charge of any office of the person, or by mailing it by registered or certified mail to that representative at his last known address.

(d) The original subpoena bearing a certificate of service shall be filed with the Department official having responsibility for the proceeding in connection with which the subpoena was issued.

(e) Any person to whom a subpoena is directed may, prior to the time specified therein for compliance, but in no event more than 10 days after the date of service of such subpoena, apply to the designated Department official who issued the subpoena, or if he is unavailable, to the Director, to quash or modify the subpoena. The application shall contain a brief statement of the reasons relied upon in support of the action sought therein. The Director, or the designated Department official, as the case may be, may:

- (1) Deny the application;
- (2) Quash or modify the subpoena; or
- (3) Condition denial of the application to quash or modify the subpoena upon the satisfaction of certain just and reasonable requirements. The denial may be summary.

(f) If there is a refusal to obey a subpoena served upon any person under the provisions of this section, the Department may request the Attorney General to seek the aid of the Circuit Court or any court of competent jurisdiction in which the person is found, to compel that person, after notice, to appear and give testimony, or to appear and produce the subpoenaed documents before the Department, or both.

Subpart B-Exemptions

107.101 Purpose and scope.

This subpart prescribes procedures by which persons who are not subject to the federal hazardous materials regulations, but who are subject to the requirements of this chapter may obtain administrative relief therefrom in the form of an exemption. Exemptions provided for in this subpart will be granted only where they insure equivalent levels of safety or levels of safety consistent with the public interest and the policy of the Illinois Hazardous Materials Transportation Act.

107.102 Persons holding federal exemptions.

Any valid exemption issued by the Secretary of the U.S. Department of Transportation under Section 107 of the federal Hazardous Materials Transportation Act (49 U.S.C. 1806) shall be considered a valid exemption issued under this subpart.

107.103 Applications for exemptions for persons transporting hazardous materials not governed by the federal Hazardous Materials Regulations.

(a) Any person who is subject to the requirements of this chapter and who transports hazardous materials not governed by the federal Hazardous Materials Regulations may apply to the Director for an exemption from the Illinois requirements.

(b) Each application filed under this section for an exemption must-

(1) Be submitted to: Division of Traffic Safety, Illinois Department of Transportation, 2300 South Dirksen Parkway, Springfield, Illinois 62764;

(2) Set forth the text or substance of the regulation from which the exemption is sought;

(3) State the name, address, and telephone number of the applicant;

(4) Include a detailed description of the proposal, including when appropriate, drawings, plans, calculations, procedures, test results, previous exemptions, approvals or permits, a list of specification containers, if any, to be used, a list of modified specification containers, if any, to be used, and a description of the modifications, and any other supporting information;

(5) State the chemical name, common name, hazard classification, form, quantity, properties, and characteristics of the material covered by the proposal, including composition and percentage (specified by volume or weight) of each chemical, if a solution or mixture;

(6) Describe all relevant shipping and accident experience;

(7) Specify the proposed mode of transportation, identify any increased risks that are likely to result if the exemption is granted, and specify the safety control measures which the applicant considers necessary or appropriate to compensate for those increased risks;

(8) State that the transportation described in the proposal is not governed by the federal Hazardous Materials Regulations.

(9) State why the applicant believes the proposal including any safety control measures specified by the applicant will achieve a level of safety which-

(i) Is at least equal to that specified in the regulation from which the exemption is sought, or

(ii) If the regulations do not contain a specified level of safety, will be consistent with the public interest and will adequately protect against the risks of life and property which are inherent in the transportation of hazardous materials in commerce;

(10) If the applicant seeks to have the application processed on a priority basis, set forth the

supporting facts and reasons; and

(11) To permit timely consideration, an application should be submitted at least 60 days before the requested effective date.

If the applicant wishes to claim confidential treatment for any information contained in the application, the procedures set forth in 107.5 apply.

107.105 Application for renewal

(a) Each application for the renewal of an exemption issued under this subpart must--

(1) Be submitted to: Division of Traffic Safety, Illinois Department of Transportation, 2300 South Dirksen Parkway, Springfield, Illinois 62764;

(2) Identify the exemption for which a renewal is requested;

(3) State the name, address, and telephone number of the applicant;

(4) Include (i) a certification by the applicant that the descriptions, technical information, and safety assessment submitted in the original application, or as may have been updated by any subsequent application for renewal, remain accurate and correct, or (ii) such amendments to the previously submitted descriptions, technical information and safety assessment as is necessary to update them and assure their accuracy and correctness;

(5) Include a statement describing all relevant shipping and all accident experience that has occurred in connection with the exemption since its issuance or most recent renewal or, if no accidents have been experienced, a certification to that effect. This statement must include the approximate number of shipments made or packages shipped, as the case may be, and the number of shipments or packages involved in any loss of contents, including loss by venting when transporting a compressed or cold temperature gas.

(b) To permit timely consideration, an application for renewal should be submitted at least 60 days before the expiration date of the exemption.

(c) If, at least 60 days prior to the expiration of an existing exemption of a continuing nature, the holder files an application for renewal which is complete and conforms with the requirements of this section, the exemption will not be considered to have expired until the application for renewal has been finally determined.

107.107 Initial application review.

In the case of a written application for an exemption submitted as provided in 107.103(b) or the renewal of an exemption submitted as provided in 107.105, the Director reviews the

application to determine whether it is complete and conforms with the requirements of this subpart. If an application is returned, the applicant will be informed in what respects the application is incomplete.

107.109 Processing of application

(a) After an application for an exemption or renewal of an exemption is determined to be complete, the Director docket the application.

(b) No public hearing, argument, or other formal processing is held directly on an application filed under this section. However, during the processing of an application the Director may require the applicant to supply additional information.

(c) If the Director determines that the application does not contain adequate justification, he denies it and notifies the applicant in writing, together with the reasons therefor.

(d) If the Director determines that the application contains adequate justification, he grants it subject to the conditions set forth in Appendix A to this subpart and such other terms as he considers necessary, and notifies the applicant in writing.

(e) If the Director determines that an application concerns a matter of such general applicability and future effect as to warrant being made the subject of rulemaking, he may initiate rulemaking under Part 102 of this subchapter in addition to or in lieu of granting or denying the application.

107.111 Party to an exemption

(a) Any person who desires to apply for the same or substantially the same exemption for which another person has made application may be made a part to that application by filing his own application with the Director, accompanied by a request to have his application considered with the application for exemption of the other person.

(b) Each application filed under this section must--

(1) Be submitted to: Division of Traffic Safety, Illinois Department of Transportation, 2300 South Dirksen Parkway, Springfield, Illinois 62764;

(2) Identify the exemption application or exemption to which the applicant seeks to become a party; and

(3) State the name, address and telephone number of the applicant.

107.113 (Reserved)

107.115 (Reserved)

107.117 Withdrawal

(a) An applicant may withdraw an application at any time prior to it being finally determined.

(b) Except for documents for which confidential treatment was requested by the applicant, withdrawal of an application does not authorize the removal of any related records from the dockets or files of the Division.

107.119 Termination

(a) An exemption and any renewal thereof terminates according to its terms but not later than two years after the date of issuance unless terminated sooner pursuant to paragraph (b) or (c) of this section.

(b) The Director may suspend an exemption if he determines that-

(1) An activity under the exemption is not being performed in accordance with the terms of the exemption; or

(2) On the basis of information not available at the time it was granted, an amendment to the terms of the exemption is necessary to adequately protect against risks to life and property.

(c) The Director terminates an exemption if he determines that-

(1) The exemption is no longer consistent with the public interest;

(2) The exemption is no longer necessary because of an amendment to the regulations; or

(3) The exemption was granted on the basis of false, fraudulent, or misleading representations or information.

(d) Unless the Director believes that immediate suspension or termination is necessary to abate the risk of an imminent hazard, he notifies the holder in writing of the reasons therefor and provides the holder an opportunity to show why the exemption should not be suspended or terminated, before he suspends or terminates an exemption under paragraph (b) or (c) of this section.

107.121 Appeal.

Any applicant for an exemption or the renewal of an exemption aggrieved by an action taken by the Director under this subpart and any holder of an exemption suspended or terminated by the Director under 107.119 (b) or (c) may file an appeal with the Secretary. The appeal must be filed within 30 days of service of notification of that action, suspension or termination. There has not been an exhaustion of administrative remedies until an appeal has been filed and the appellate process is completed by the issuance of an order by the Secretary granting or denying the appeal.

107.123 Availability for public inspection

(a) Information relevant to an application under this Part, including the application and supporting data, memoranda of any informal meetings with the applicant, and the grant or denial of the application is available for public inspection and copying, except as specified in paragraph (b) of this section, at the Division of Traffic Safety, Illinois Department of Transportation, 2300 South Dirksen Parkway, Springfield, Illinois 62764.

(b) Information made available for inspection does not include materials which the Director determines should be withheld from public disclosure under 107.5.

Subpart C-(Reserved)

Subpart D-Enforcement

107.301 Responsibility for enforcement

In accordance with delegations of authority from the Secretary, responsibility for enforcement of this chapter is exercised by:

(a) The Department of Transportation;

(b) The Division of State Police of the Department of Law Enforcement;

(c) The Department of Public Health with respect to the transportation or shipment of radioactive materials; and

(d) Any other department or agency of State government with which the Secretary concludes an interagency agreement.

107.303 Purpose and scope

This subpart describes the various enforcement authorities exercised by the Department and the associated sanctions and prescribes the procedures governing the exercise of those authorities and the imposing of those sanctions.

107.305 Investigations

(a) General. The Department may conduct investigations relating to compliance by any person with any provision of this chapter and any order issued thereunder, or any court decree relating thereto.

(b) Confidentiality. Information received in an investigation under this section, including the identity of the person investigated and any other person who provides information during the investigation, shall, unless otherwise determined by the Department, remain confidential.

107.307 Inspection and examination of records and properties

(a) Any representative of the state acting under delegation of authority in 107.301, upon presenting appropriate credentials, may enter without delay, inspect and examine the records and properties of any person to the extent such records and properties relate to the transportation or shipment of hazardous materials on the highways of this State. All such inspections and examinations shall be conducted during regular working hours and in a reasonable manner.

(b) If any person refuses to permit the representative to make an inspection or examination in accordance with Section 107.307(a), the representative shall terminate the inspection or confine the inspection to areas concerning which no objection is raised. The representative shall endeavor to ascertain the reason for such refusal and shall immediately report the matter to the Director. If the Director desires to have an inspection and examination conducted, he may refer the matter to the Department's Office of Chief Counsel to take appropriate action, including compulsory process, if necessary.

107.308 Notice of apparent violation

(a) When any representative of the state acting under delegation of authority in 107.301 has reason to believe that a person is engaging in conduct which involves a violation of any provision of these regulations, or of any exemption under Subpart B, the representative shall issue a notice of apparent violation.

(b) A notice of apparent violation shall be issued:

(1) In the case of a violation observed at any location where hazardous materials are handled, to the person in charge of or responsible for the place or location who is present at the time the violation is observed and, if that person is not the owner or lessor of the place or location, to the owner or lessor of the place or location.

(2) In the case of a violation involving a motor vehicle intended to be used or being used for the transportation of hazardous materials, or in the case of a violation observed occurring in the course of the transportation of hazardous materials, to the driver or operator of the vehicle and to the employer of the driver or operator and, to the owner or lessor of the vehicle if the owner or lessor is a person other than the driver or operator or the employer of the driver or operator.

(3) In the case where an individual person is observed to be knowingly violating or to have knowingly violated these regulations, to that individual person and, if applicable, to the employer of that person.

(4) In all other cases, to a responsible person present at the time the violation is observed, and if that person is not the owner or lessor of the place or location, to the owner or lessor of the place or location.

(c) The notice of apparent violation shall be served in accordance with 107.11.

(d) Copies of the notice of apparent violation shall be forwarded to the Director.

107.309 Stopping of vehicles

(a) The State Police shall stop any vehicle when the State Police has reason to believe that an imminent hazard exists. "Imminent hazard," as used in this subsection, exists if there is a likelihood that death, serious illness, or personal injury will occur prior to the completion of a formal proceeding initiated to abate the risk of such harm.

(b) If the State Police stop a vehicle pursuant to 171.2(c), the State Police shall prevent the further movement of the hazardous materials and shall tag the vehicle carrying the hazardous material so as to place the vehicle out of service until such time as the imminent danger observed is abated.

(c) Whenever the State Police stop a vehicle and the driver or operator of the vehicle is able to properly abate the existing danger, the vehicle shall be permitted to continue in service; however, the State Police shall notify the Director of the matter and the Director shall notify the employer of the driver or operator and the owner or lessor of the vehicle if the owner or lessor is not the employer.

107.310 Department review of notice of apparent violation

Upon receiving a copy of a notice of apparent violation, the Director shall review the notice and determine whether any further administrative action is required. If the Director determines that further administrative action is required, the Director may take any administrative action set forth in this subpart he believes is appropriate.

WARNING LETTER

107.311 Warning letter

(a) When the Director has reason to believe that a person is engaging in conduct which involves a violation of any provision of these regulations, the Director may issue a warning letter which shall:

(1) Advise the person of the time, place and circumstances of the apparent violation;

(2) Advise the person to correct the violation by a date designated by the

Director;

(3) Advise the person that a subsequent inspection may be conducted to ascertain whether the violation has been corrected; and

(4) Warn the person not to repeat the violation in the future.

(b) The warning letter shall be served in the manner prescribed in 107.11.

107.312 [Reserved]

CIVIL PENALTIES

107.313 Civil penalties generally

When the Department has reason to believe that a person has knowingly committed an act which is a violation of any provision of these regulations it may conduct proceedings to assess and, if appropriate, compromise a civil penalty.

107.314 Maximum penalties

A person who knowingly commits an act that is a violation of any of these regulations is liable for a civil penalty of not more than \$10,000 for each violation. When the violation is a continuing one, each day of the violation constitutes a separate offense.

107.315 Notice of probable violation

(a) The Department begins a civil penalty proceeding by serving a notice of probable violation on a person charging him with having violated one or more provisions of these regulations.

(b) A notice of probable violation issued under this section includes:

(1) A statement of the provision(s) of the regulations which the respondent is believed to have violated;

(2) A statement of the factual allegations upon which the proposed civil penalty is being sought;

(3) Notice of the maximum amount of civil penalty for which the respondent may be liable;

(4) Notice of the amount of the preliminary assessed civil penalty;

(5) A description of the manner in which the respondent should make payment of any money to the State;

(6) A statement of the respondent's right to present written or oral explanations,

information, or any materials in answer to the allegations or in mitigation of the penalty; and

(7) A statement of the respondent's right to request a hearing and the procedures for requesting a hearing.

107.316 Reply.

(a) Within 30 days of the service of a notice of probable violation issued under 107.315, the respondent may:

(1) Pay the preliminary assessment as provided in 107.317(a) and thereby close the case; or

(2) Request a hearing as provided in 107.318.

(b) The Department official who issued the notice of probable violation may extend the 30-day period for good cause shown.

(c) Failure of the respondent to reply by taking one of the two actions described in paragraph (a) of this section within the period provided constitutes a waiver of his right to appear and contest the allegations, and authorizes the Director, without further notice to the respondent, to find the facts to be as alleged in the notice of probable violation and order the assessment of an appropriate civil penalty.

107.317 Payment of penalty.

(a) Payment of a civil penalty should be made by certified check or money order payable to the Treasurer of the State of Illinois and sent to the Director, Division of Traffic Safety, Illinois Department of Transportation, 2300 South Dirksen Parkway, Springfield, Illinois 62764.

(b) At any time after an order assessing a civil penalty is referred to the Attorney General for collection, the respondent may offer to compromise for a specific amount by submitting a certified check or money order for that amount to the Director who, with the consent of the Attorney General, may accept or reject it. If it is accepted, the respondent is notified in writing by the Director that the acceptance is in full settlement of the civil penalty for the violation.

107.318 Request for hearing.

(a) If a respondent elects to request a hearing, he shall submit a written request to the Director. The request must:

(1) State the name and address of the respondent and of the person signing the request if different from the respondent;

(2) State with respect to each allegation whether it is admitted or denied; and

(3) State with particularity the issues to be raised by the respondent at the hearing.

(b) After a request for hearing which complies with the requirements of paragraph (a) of this section, the Director schedules a hearing for the earliest practicable date.

(c) The Director may grant extensions of the time of the commencement of the hearing for good cause shown.

107.319 Hearing

(a) When a hearing is requested and scheduled under 107.318, the Director or an official designated by him convenes and presides over the hearing. To the extent practicable, the hearing will be held near the place where the alleged violation occurred or at a place convenient to the respondent. Testimony by witnesses shall be given under oath and the hearing shall be recorded verbatim.

(b) The presiding official may:

(1) Administer oaths and affirmations;

(2) Issue subpoenas as provided by 107.13;

(3) Adopt procedures, including the submission of evidence in written form;

(4) Take or cause depositions to be taken;

(5) Rule on offers of proof and receive relevant evidence;

(6) Examine witnesses at the hearing;

(7) Convene, recess, reconvene, adjourn and otherwise regulate the course of the hearing;

(8) Hold conferences for settlement, simplification of the issues or any other proper purpose; and

(9) Take any other action authorized by or consistent with the provisions of this subpart pertaining to civil penalties and permitted by law which may expedite the hearing or aid in the disposition of an issue raised therein.

(c) The Department official who issued the notice of probable violation, or his representative, has the burden of proving the facts alleged in the notice of probable violation and may offer such relevant information as may be necessary to fully inform the presiding officer as to the matter concerned.

(d) The respondent may appear and be heard on his own behalf or through counsel of his choice. The respondent or his counsel may offer relevant information including testimony which he believes should be considered in defense of the allegations or which may bear on the penalty to be assessed and conduct such cross-examination as may be required for a full disclosure of the facts.

107.320 Presiding officer's decision

(a) After consideration of the evidence of record, the presiding officer may dismiss the notice or probable violation in whole or in part. If he does not dismiss it in whole, he will issue and serve on the respondent an order assessing a civil penalty. The order will include a statement of findings and conclusions as well as the reasons therefor on all material issues of fact, law, and discretion.

(b) If, within 20 days after service of an order assessing a civil penalty, the respondent does not pay the civil penalty or file an appeal as provided in 107.323(a), the case shall be referred to the Attorney General with a request that an action to collect the penalty be brought in the appropriate Circuit Court.

107.321 Assessment considerations

In assessing a civil penalty under 107.-320, the assessment is made only after considering:

(a) The nature and circumstances of the violation;

(b) The extent and gravity of the violation;

(c) The degree of the respondent's culpability;

(d) The respondent's history of prior offenses;

(e) The respondent's ability to pay;

(f) The effect on the respondent's ability to continue in business; and

(g) Such other matters as justice may require.

107.322 [Reserved]

107.323 Appeal

(a) A respondent aggrieved by a presiding officer's decision and order issued under 107.320 assessing a civil penalty may file an appeal with the Secretary. The appeal must be filed within 20 days of service of the presiding officer's order.

(b) The decision of the Secretary on appeal shall be made on the record of the hearing, including all pleadings and the decision of the officer who presided at the hearing. No new or additional evidence shall be considered by the Secretary without a positive showing by the party presenting such evidence that the evidence was not available or, through due diligence, could not have been made available at the hearing. At the discretion of the Secretary and upon reasonable notice to the parties oral argument may be had on appeal. Any party requesting oral argument must detail in his petition for appeal the reasons for the request for argument.

(c) If the Secretary affirms the assessment and the respondent does not pay the civil penalty within 20 days after service of the Secretary's decision on appeal, the case may be referred to the Attorney General with a request that an action to collect the penalty be brought in the appropriate Circuit Court.

(d) Petition for appeal shall detail the assailed findings and be confined to factual and legal issues which are essential to the ultimate and just determination of the proceeding. Petitions shall not exceed 10 pages in length, excluding a separate preface and summary of argument which shall not exceed 3 pages. A reply to the petition, if any, shall be filed within 20 days of receipt of the petition for appeal and shall meet the same requirements as to length and format.

(e) The filing of the petition shall stay the effect of the prior decision, order or requirement pending the determination of the appeal.

COMPLIANCE ORDERS

107.331 Compliance orders generally

When the Department has reason to believe that a person is engaging in conduct which involves a violation of any provision of these regulations, the Department may conduct proceedings to determine the nature and extent of the violation and may thereafter issue an order directing compliance.

107.333 Notice of probable violation

(a) The Department begins a compliance order proceeding by serving a notice of probable violation on a person

charging him with violating one or more provisions of these regulations.

(b) A notice of probable violation issued under this section includes:

(1) A statement of the provision(s) of the regulations which the respondent is believed to be violating;

(2) A statement of the factual allegation upon which remedial action is being sought; and

(3) A statement of the remedial action being sought in the form of a proposed compliance order.

(c) The Department may amend a notice of probable violation issued under this section at any time before the entry of a final compliance order. If an amendment includes any new material allegation of fact or seeks new or additional remedial action, the respondent is given an opportunity to respond.

107.334 Reply

(a) Within 30 days of the service of a notice of probable violation issued under 107.333, the respondent may file a reply with the Department official who issued the notice of probable violation. That official may extend the 30-day period for good cause shown.

(b) The reply must be in writing, signed by the person filing it, and state with respect to each factual allegation whether it is admitted or denied. Even though formally denied, a factual allegation set forth in a notice of probable violation is considered to be admitted for purposes of the proceeding unless:

(1) Opposed by the written statement of an individual having personal knowledge of the subject matter;

(2) Challenged as being in error together with a supporting explanation as to why it is believed to be in error; or

(3) Otherwise contested or contradicted through the submission of relevant evidence.

(c) The reply must set forth any defenses and include a statement of the form and nature of proof by which those defenses are to be established.

(d) If it is necessary to respond to an amendment to the notice of probable violation, the respondent may amend his reply at any time before the issuance of an order under 107.337.

(e) If the respondent elects not to contest one or more factual allegations,

he should so state in the reply. An election not to contest a factual allegation is an admission of that allegation solely for the purpose of issuing a compliance order and constitutes a waiver of hearing as to that allegation but does not, by itself, constitute a waiver of the right to be heard on other issues. In connection with a statement of election not to contest a factual allegation, the respondent may propose an appropriate order for issuance by the Director, or propose the negotiation of a consent order.

(f) Failure of the respondent to file a reply within the period provided constitutes a waiver of his right to appear and contest the allegation and authorizes the Director, without further notice to the respondent, to find the facts to be as alleged in the notice of probable violation and to issue an appropriate order directing compliance.

107.335 Consent order

(a) At any time before the issuance of an order under 107.337, the Department and the respondent may execute an agreement for disposing of the case by the entry of a consent order. If the Director accepts the agreement, he issues an order in accordance with its terms. If the Director rejects the agreement, he directs that the proceeding continue.

(b) An agreement submitted to the Director under this section must include:

- (1) A proposed compliance order suitable for the Director's signature;
- (2) An admission of all jurisdictional facts;
- (3) An express waiver of further procedural steps and of all right to seek judicial review or otherwise challenge or contest the validity of the order; and
- (4) An acknowledgement that the notice of probable violation may be used to construe the terms of the order.

107.336 Hearing

(a) When a respondent files a reply contesting allegations in a notice of probable violation issued under 107.333 or when the Department and the respondent fail to agree upon an acceptable consent order, the Director or an official designated by him convenes and presides over a hearing on the proposed compliance order. Testimony by witnesses shall be given under oath and the hearing shall be recorded verbatim.

- (b) The presiding official may:
 - (1) Administer oaths and affirmations;
 - (2) Issue subpoenas as provided by 107.13;
 - (3) Adopt procedures, including the submission of evidence in written form;
 - (4) Take or cause depositions to be taken;
 - (5) Rule on offers of proof and receive relevant evidence;
 - (6) Examine witnesses at the hearing;
 - (7) Convene, recess, reconvene, adjourn and otherwise regulate the course of the hearing;
 - (8) Hold conferences for settlement, simplification of the issues or any other proper purpose; and
 - (9) Take any other action authorized by or consistent with the provisions of this subpart pertaining to compliance orders and permitted by law which may expedite the hearing or aid in the disposition of an issue raised therein.

(c) The Department official who issued the notice of probable violation, or his representative, has the burden of proving the facts alleged in the notice of probable violation and may offer such relevant information as may be necessary to fully inform the presiding officer as to the matter concerned.

(d) The respondent may appear and be heard on his own behalf or through counsel of his choice. The respondent or his counsel may offer relevant information including testimony which he believes should be considered in defense of the allegations or which may bear on the remedial action being sought and conduct such cross-examination as may be required for a full disclosure of the facts.

107.337 Presiding officer's decision

(a) After consideration of evidence, the presiding officer may dismiss the notice of probable violation or issue an order directing compliance. The order will include a statement of findings and conclusions as well as the reasons therefor on all material issues of fact, law, and discretion.

(b) A compliance order issued under this section is effective upon service on the respondent unless otherwise provided therein.

107.338 Compliance order for immediate compliance

- (a) Notwithstanding 107.333 through

107.337, the Director may issue a compliance order for immediate compliance, which is effective upon issuance, and until rescinded or suspended, if he finds:

(1) There is strong probability that a violation is occurring or is about to occur;

(2) The violation poses an unreasonable risk to health or to safety of life or property; and

(3) The public interest requires the avoidance or amelioration of that unreasonable risk through immediate compliance and waiver of the procedures afforded under 107.333 through 107.337.

(b) A compliance order for immediate compliance is served promptly upon the person against whom the order is issued by telex or telegram, with a copy served in the manner provided in 107.11. The copy contains a written statement of the relevant facts and the legal basis for the order, including the findings required by paragraph (a) of this section.

(c) The Director may rescind or suspend a compliance order for immediate compliance if it appears that the criteria set forth in paragraph (a) of this section are no longer satisfied. When appropriate, however, such a suspension or rescission may be accompanied by a notice of probable violation issued under 107.333.

(d) If at any time in the course of a proceeding commenced by a notice of probable violation the criteria set forth in paragraph (a) of this section are satisfied, the Director may issue a compliance order for immediate compliance, even if the 30-day period for reply specified in 107.334(a) has not expired.

(e) At any time after a compliance order for immediate compliance has become effective, the Secretary may request the Attorney General to bring an action for appropriate relief in accordance with 107.341.

107.339 Appeal

(a) A respondent aggrieved by a compliance order or a compliance order for immediate compliance may file an appeal with the Secretary. The appeal must be filed within 20 days after service of the compliance order.

(b) The decision of the Secretary on appeal shall be made on the record of the hearing, including all pleadings and the decision of the officer who presided at the hearing. No additional evidence shall be considered by the Secretary without a positive showing by the party presenting

such evidence that the evidence was not available or, through due diligence, could not have been made available at the hearing. At the discretion of the Secretary and upon reasonable notice to the parties oral argument may be had on appeal. Any party requesting oral argument must detail in his petition for appeal the reasons for the request for argument.

(c) The filing of an appeal does not stay the effectiveness of the order unless the Secretary expressly so provides.

(d) Petition for appeal shall detail the assailed findings and be confined to factual and legal issues which are essential to the ultimate and just determination of the proceeding. Petitions shall not exceed 10 pages in length, excluding a separate preface and summary of argument which shall not exceed 3 pages. A reply to the petition, if any, shall be filed within 20 days of receipt of the petition for appeal and shall meet the same requirements as to length and format.

INJUNCTIVE ACTION

107.341 Injunctions generally

Whenever it appears to the Department that a person has engaged, is engaged, or is about to engage in any act or practice constituting a violation of any provision of these regulations or of any order issued thereunder, the Secretary may request the Attorney General to bring an action in the appropriate Circuit Court for such relief as is necessary, including mandatory or prohibitive injunctive relief, and interim equitable relief.

107.343 Imminent hazards

Whenever it appears to the Department that there is a substantial likelihood that death, serious illness, or severe personal injury will result from the transportation of a particular hazardous material before a compliance order proceeding or other administrative hearing or formal proceeding to abate the risk of that harm can be completed, the Department shall, through the Attorney General or State's Attorney, bring an action in the appropriate Circuit Court for an order suspending or restricting the transportation of that hazardous material, or for such other equitable relief as is necessary or appropriate to ameliorate the hazard as provided by Section 13 of the Act.

CRIMINAL PENALTIES

107.371 Criminal penalties generally

Section 12 of the Act provides a criminal penalty of a fine of not more than \$25,000 for any person who willfully violates a provision of the Act or a regulation issued under the Act.

107.373 Referral for prosecution

If the Department becomes aware of a possible willful violation of the Act, or any provision of the regulations, the Department reports it to the Department's Office of Chief Counsel. If appropriate, the Chief Counsel refers the report to the Attorney General or State's Attorney for criminal prosecution of the offender.

Appendix A

STANDARD CONDITIONS APPLICABLE TO EXEMPTIONS PACKAGES, CONTAINERS, SHIPMENTS

Exemptions from the regulations governing packages, containers, and the preparation and offering of hazardous materials for shipment are subject to the following conditions:

(1) The outside of each package must be plainly and durably marked "DOT-E or IDOT-E, as appropriate," followed by the exemption number assigned. On portable tanks, cargo tanks and tank car tanks, the markings must be in letters at least two inches high on a contrasting background.

(2) Each shipping paper issued in connection with a shipment made under an exemption must, in association with the entries required by 172.203(a), bear the notation "DOT-E or IDOT-E, as appropriate," followed by the exemption number assigned.

(3) When an exemption issued to a shipper contains special carrier requirements, the shipper shall furnish a copy of the exemption to the carrier before or at the time a shipment is tendered.

PARTS 108—169 [RESERVED]

SUBCHAPTER C—HAZARDOUS MATERIALS REGULATIONS

PART 170 (RESERVED)

PART 171—GENERAL INFORMATION, REGULATIONS, AND DEFINITIONS

Sec.	
171.1	Purpose and scope.
171.2	General transportation require- ments.
171.3	[Reserved]
171.4	[Reserved]
171.5	[Reserved]
171.6	Agricultural exception.
171.7	Matter incorporated by reference.
171.8	Definitions and abbreviations.
171.9	Rules of construction.
171.10	[Reserved]
171.11	[Reserved]
171.12	Import and export shipments.
171.13	[Reserved]
171.14	Specification markings.
171.15	Notification and reporting of haz- ardous materials incidents.
171.16	[Reserved]

Authority: Illinois Revised Statutes, Chapter 95 1/2, Paragraphs 700-4(a) and 700-9(a).

171.1 Purpose and scope.

This chapter prescribed the requirements of the Illinois Department of Transportation governing the transportation of hazardous materials by highway within the State of Illinois.

171.2 General transportation re- quirements.

(a) Except as provided in Section 171.12, and paragraph (d) of this section, no person may offer or accept a hazardous material for transportation by highway in Illinois in a quantity that would require placarding under Subpart F of Part 172 of this subchapter, unless that material is properly classed, described, packaged, marked, labeled, and in the condition for shipment as required by this subchapter.

(b) Except as provided in Section 171.12, and paragraph (d) of this section, no person may accept for transportation or transport a hazardous material by highway in Illinois in a quantity that would require placarding under Subpart F of Part 172 of this subchapter, unless that material is handled and transported in accordance with this subchapter.

(c) No person may offer, accept, or transport a hazardous material by highway in Illinois, regardless of the quantity of hazardous material in the shipment or on the vehicle, if that material poses an imminent danger to the public. The State Police are authorized to stop any vehicle that constitutes an imminent danger. For the purpose of this section, an imminent danger exists if, in the opinion of the State Police officer or the representative of the Department at the scene, the offer, acceptance, or transportation of that hazardous material is likely to cause death, serious illness, or severe personal injury.

(d) Except as provided in Section 171.12, no person may offer or accept for transportation, or transport any quantity of radioactive material by highway in Illinois unless that material is properly classed, described, packaged, marked, labeled, handled and transported in accordance with this subchapter.

171.3-171.5 (Reserved)

171.6 Agricultural Exception

(a) These regulations do not apply to the transportation of those hazardous materials cited below when such commodities are transported from retailer to final agricultural end user, or between final end users from farm

to farm in approved containers and in the amounts and manner specified:

(1) Agricultural pesticides classified as Class B Poison or Flammable by these regulations, when moved in quantities of 5,000 pounds or less (aggregate gross weight) or 500 gallons or less volume in solution;

(2) Gasoline, diesel fuels, oils, lubricants, and liquefied petroleum gas when moved in quantities of 3,000 gallons or less and properly placarded in accordance with Section 172.504(a).

(3) Ammonium nitrate fertilizer when moved in quantities of 16,000 pounds (aggregate gross weight) or less.

(4) Anhydrous ammonia when transported in a cargo tank (commonly known as a nurse tank and considered an implement of husbandry) operated by private carriers exclusively for agricultural purposes, provided the cargo tank:

(i) Has a minimum design pressure of 250 p.s.i. and meets the requirements of the ASME code in effect at time of manufacture and is marked accordingly;

(ii) Is equipped with safety relief valves meeting the requirements of CGA Pamphlet S1.2;

(iii) Is painted white or aluminum;

(iv) Has a capacity of 1,500 gallons or less;

(v) Is loaded to a filling density of 56 percent of water density (85 percent of volume capacity);

(vi) Is drawn as a loaded, single unit trailer at speeds not to exceed 25 m.p.h. and is appropriately marked with a slow-moving-vehicle sign, except that two empty trailers (carrying tanks containing less than 25 percent of each tank's volume capacity) may be pulled in tandem;

(vii) Is operated on a public highway only during daylight hours;

(viii) Is moving anhydrous ammonia from retail to final agricultural end user or between final end users from farm to farm;

(ix) Is marked on each side and on the rear of the container with the words "Caution - Ammonia" on a background of sharply contrasting colors in letters at least 4 inches high, or in lieu of the foregoing markings is placarded on each side and each end with non-flammable gas placards meeting the requirements of 172.528 of these regulations.

171.7 Matter incorporated by reference.

(a) There is incorporated by reference in this chapter all matter referred to that is not specifically set forth. These materials are hereby made a part of the regulations in this chapter. Unless the reference provides otherwise, matter subject to change is incorporated only as it is in effect on the date of issuance of the regulation referring to that matter.

(b) (Reserved)

(c) Matter incorporated by reference is available for distribution as follows:

(1) ASME: American Society of Mechanical Engineers, United Engineering Center, 345 East 47th Street, New York, N.Y. 10017.

(2) American National Standard: American National Standards Institute, Inc., 1430 Broadway, New York, N.Y. 10018.

(3) CGA: Compressed Gas Association, Inc., 500 Fifth Avenue, New York, N.Y. 10036.

(4) Bureau of Explosives: Bureau of Explosives, Association of American Railroads, American Railroads Building, 1920 L Street NW., Washington, D.C. 20036.

(5) AAR: Association of American Railroads, 59 East Van Buren Street, Chicago, Ill. 60605.

(6) ASTM: American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pa. 19103.

(7) API: American Petroleum Institute, 1801 K Street NW., Washington, DC 20006.

(8) AISI: American Iron and Steel Institute, 1000 16th Street NW., Washington, D.C. 20036.

(9) The Chlorine Institute, 342 Madison Avenue, New York, N.Y. 10017.

(10) MCA: Manufacturing Chemists' Association, Inc., 1825 Connecticut Avenue, NW., Washington, D.C. 20009.

(11) NFPA: National Fire Protection Association, 60 Batterymarch Street, Boston, Mass. 02110.

(12) Aluminum Association: The Aluminum Association, 420 Lexington Avenue, New York, N.Y. 10017.

(13) NACE: National Association of Corrosion Engineers, 2400 West Loop South, Houston, TX 77027.

(14) IME: Institute of Makers of Explosives, 420 Lexington Avenue, New York, NY 10017.

(15) IAEA: International Atomic Energy Agency, Karntner Ring 11, Post Office Box 590, A-1011, Vienna, Austria (IAEA publications may be purchased in the United States from: Unipub, Inc., Post Office Box 433, New York, NY 10016).

(16) USAEC: U.S. Atomic Energy Commission, Washington, D.C. 20545. Regulations of the USAEC are available from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Other publications by the USAEC may be obtained from the National Technical Information Center,

U.S. Department of Commerce, Springfield, Va. 22151.

(17) Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

(18) National Wooden Box Association, Post Office Box 1010, Cumberland, Maryland 21502.

(19) TFI: The Fertilizer Institute, 1015 18th Street N.W., Washington, D.C. 20036.

(20) AWWA: American Water Works Association, 2 Park Avenue, New York, New York 10016.

(21) AWS: American Welding Society, 345 East 47th Street, New York, New York 10016.

(22) USDC: U.S. Department of Commerce, National Technical Information Service, 5285 Port Royal Road, Springfield, Virginia 22151.

(23) Inter-governmental Maritime Consultative Organization, 101-104 Piccadilly, London, W1V 0AE, England.

(24) Uniform Classification Committee, 222 South Riverside Plaza, Chicago, Ill. 60606.

(25) USERDA: United States Energy Research and Development Administration, Washington, D.C. 20545.

(26) USNRC: United States Nuclear Regulatory Commission, Washington, D.C. 20555.

(d) The full title and application of the matter incorporated by reference in Parts 170-189 of this chapter are as follows:

(1) ASME Code means sections VIII (Division I) and IX of the 1974 edition of the "American Society of Mechanical Engineers Boiler and Pressure Vessel Code," and addenda thereto through June 30, 1976.

(2) AAR Specifications for Tank Cars means the 1970 edition of the "Association of American Railroads Specification for Tank Cars".

(3) Compressed Gas Association:

(i) CGA Pamphlet C-3 is titled, "Standards for Welding and Brazing on Thin Walled Containers," 1968 edition;

(ii) CGA Pamphlet C-6 is titled, "Standards for Visual Inspection of Compressed Gas Cylinders," 1968 edition;

(iii) Compressed Gas Association pamphlet C-7, Appendix A is titled, "A Guide for the Precautionary Markings for Compressed Gas Containers", dated May 15, 1971, Addenda issued January 1976.

(iv) CGA Pamphlet C-8 is titled, "Standard for Requalification of DOT-

3HT Cylinders," 1972 edition.

(v) CGA Pamphlet S-1.2 is titled, "Safety Relief Device Standards Part 2—Cargo and Portable Tanks for Compressed Gases," 1966 edition.

(4) American National Standards:

(i) American National Standard B9.1, is titled, "Safety Code for Mechanical Refrigeration," 1964 edition.

(ii) American National Standard B16.5 is titled, "Steel Pipe Flanges and Fittings," 1968 edition.

(iii) American National Standard N14.1 is titled, "Packaging of Uranium Hexafluoride for Transport," 1971 edition.

(5) American Society for Testing and Materials:

(i) ASTM D1310 is titled, "Standard Method of Test for Flash Point of Volatile Flammable Materials By Tag Open-Cup Apparatus," 1967 edition;

(ii) ASTM D323 is titled, "Test for Vapor Pressure of Petroleum Products (Reid Method)," 1958 (68) edition.

(iii) ASTM D1056 is titled, "Sponge and Expanded Cellular Rubber Products, Spec. and Tests for," 1968 edition.

(6) NFPA Pamphlet No. 58 is titled, "Standard for the Storage and Handling of Liquefied Petroleum Gases," 1972 edition.

(7) Bureau of Explosives, Association of American Railroads:

(i) Bureau of Explosives Pamphlet No. 6 is titled, "Illustrating Methods for Loading and Bracing Carload and Less Than Carload Shipments of Explosives and Other Dangerous Articles," 1962 edition.

(ii) Bureau of Explosives Pamphlet No. 6A (includes appendix No. 1, October 1944, and appendix No. 2, December 1945) is titled, "Illustrating Methods for Loading and Bracing Carload and Less Than Carload Shipments of Loaded Projectiles, Loaded Bombs, etc.," 1943 edition.

(iii) Bureau of Explosives Pamphlet No. 6C is titled, "Illustrating Methods for Loading and Bracing Trailers and Less-Than Trailer Shipments of Explosives and Other Dangerous Articles via Trailer-on-Flat-Car (TOFC) or Container-on-Flat-Car (COFC)," September 1968.

(iv) Bureau of Explosives Pamphlets 1 and 2 titled "Emergency Handling of Hazardous Materials in Surface Transportation" June 1973.

(8) NACE Standard TM-01-69 is titled, "Test Method Laboratory Corro-

sion Testing of Metals for the Process Industries," 1969 edition.

(9) IME Standard is titled, "IME Standard for the Safe Transportation of Electric Blasting Caps in the Same Vehicle With Other Explosives," dated November 5, 1971 (IME Safety Library Publication No. 22).

(10) IAEA "Regulations for the Safe Transport of Radioactive Materials," 1967 edition, safety series No. 6.

(11) United States Atomic Energy Commission (USAEC).

(i) Title 10, Code of Federal Regulations, Part 71 is titled "Packaging of Radioactive Materials for Transport and Transportation of Radioactive Materials Under Certain Conditions."

(12) U.S. Department of Commerce, National Bureau of Standards Handbook H28 (1957)—Part II is titled "Screw-Thread Standards for Federal Services 1957," December 1966 edition.

(13) National Wooden Box Association's Specification 1-1B is titled "Specifications for Nailed Wooden and Lock Corner Boxes for Industrial Use" May 1958. Amended in part October 1961.

(14) American Water Works Association (AWWA) Standard C207-55 is titled, "AWWA Standard for Steel Pipe Flanges," 1955 edition.

(15) American Welding Society (AWS):

(i) AWS Code B-3.0 is titled, "Standard Qualification Procedure," 1972 edition.

(ii) AWS Code D-1.0 is titled, "Code for Welding in Building Construction," 1966 edition.

(16) USDC, CAPE-1662, one of the series of "Civilian Applications Program Engineering Drawings" which is a package of information including drawings and bills of material, describing phenolic-foam insulated, protective overpacks.

(i) USDC, USAEC Material and Equipment Specification No. SP-9, is titled, "Fire Resistant Phenolic Foam."

(ii) USDC, ORO-651 is titled, "Uranium Hexafluoride Handling Procedures and Container Criteria," Revision 3, 1972 edition.

(17) "International Maritime Dangerous Goods Code," (IMCO code) Volumes I, II, and III.

(18) "Uniform Freight Classification 11."

§ 171.8 Definitions and abbreviations.

In this subchapter,

"Approved" means approval issued or recognized by the Department unless otherwise specifically indicated in this subchapter.

"Bottle" means a container having a neck of relatively smaller cross section than the body and an opening capable of holding a closure for retention of the contents.

"Break-bulk" means packages of hazardous materials that are handled individually, palletized, or unitized for purposes of transportation as opposed to bulk and containerized freight.

"Bureau of Explosives (B of E)" of the Association of American Railroads.

"C" means Celsius or Centigrade.

"Cargo tank" means any tank permanently attached to or forming a part of any motor vehicle or any bulk liquid or compressed gas packaging not permanently attached to any motor vehicle which by reason of its size, construction, or attachment to a motor vehicle, is loaded or unloaded without being removed from the motor vehicle. Any packaging fabricated under specifications for cylinders is not a cargo tank.

"Carrier" means a person engaged in the transportation of passengers or property by highway.

"CC" means closed-cup.

"Class A explosives" See § 173.53.

"Class B explosives" See § 173.88.

"Class C explosives" See § 173.100.

"COFC" means container-on-flat-car.

"Combustible liquid" See § 173.115.

"Compressed gas" See § 173.300.

"Consumer commodity" means a material that is packaged and distributed in a form intended or suitable for sale through retail sales agencies or instrumentalities for consumption by individuals for purposes of personal care or household use. This term also includes drugs and medicines.

"Corrosive material" See 173.240.

"Cylinder" means a pressure vessel designed for pressures higher than 40 psia and having a circular cross section. It does not include a portable tank, multi-unit tank car tank, cargo tank, or tank car.

"Department" means the Illinois Department of Transportation.

"DOD" means the U.S. Department of Defense.

"Etiologic agent" See 173.386.

"F" means degree Fahrenheit.

"Federal Hazardous Materials Regulations" means those regulations promulgated by the U. S. Department of Transportation for governing the transportation of hazardous materials by all modes of transportation and covered under Parts 100-199 of Title 49 of the Code of Federal Regulations.

"Flammable gas" See § 173.300(b).

"Flammable liquid" See 173.115(a) (1).

"Flammable solid" See § 173.150.

"Flash point" means the minimum temperature at which a substance gives off flammable vapors which in contact with spark or flame will ignite. For liquids, see § 173.115 and for solids, see § 173.150.

"Freight container" means a reusable container having a volume of 64 cubic feet or more, designed and constructed to permit being lifted with its contents intact and intended primarily for containment of packages (in unit form) during transportation.

"Fuel tank" means a tank other than a cargo tank, used to transport flammable or combustible liquid, or compressed gas for the purpose of supplying fuel for propulsion of the transport vehicle to which it is attached, or for the operation of other equipment on the transport vehicle.

"Full load" applies only to radioactive materials. See § 173.389 of this subchapter for its definition.

"Gross weight" means the weight of a packaging plus the weight of its contents.

"Hazardous material" means a substance or material which has been determined by the Secretary of the U.S. Department of Transportation to be capable of posing an unreasonable risk to health, safety, and property when transported, and which has been so designated.

"Hermetically sealed" means closed by fusion, gasketing, crimping, or equivalent means so that no gas or vapor can enter or escape.

"The Illinois Vehicle Code" means the pertinent provisions of Chapter 95 1/2 of the Illinois Revised Statutes as now or hereafter amended.

"IMCO" means Inter-governmental Maritime Consultative Organization.

"Intermodal container" means a freight container designed and constructed to permit it to be used interchangeably in two or more modes of transport.

"Irritating material" See § 173.381.

"Limited quantity," when specified as

such in a section applicable to a particular material with the exception of Poison B materials, means the maximum amount of a hazardous material for which there is a specific labeling and packaging exception.

"Marking" means applying the descriptive name, instructions, cautions, weight, or specification marks or combination thereof required by this subchapter to be placed upon outside containers of hazardous materials.

"Mixture" means a material composed of more than one chemical compound or element.

"Mode" means any of the following transportation methods; rail, highway, air, or water.

"Motor vehicle" includes a vehicle, machine, tractor, trailer, or semitrailer, or any combination thereof, propelled or drawn by mechanical power and used upon the highways in the transportation of passengers or property. It does not include a vehicle, locomotive, or car operated exclusively on a rail or rails, or a trolley bus operated by electric power derived from a fixed overhead wire, furnishing local passenger transportation similar to street-railway service.

"Name of contents" means the proper shipping name as specified in § 172.101.

"Net weight" means a measure of weight referring only to the contents of a package, and does not include the weight of any packaging material.

"N.O.S." means not otherwise specified.

"NRC (non-reusable container)" means a container whose reuse is restricted in accordance with the provisions of § 173.28.

"Operator" means a person who controls the use of an aircraft, vessel, or vehicle.

"Organic peroxide" See § 173.151.

"ORM" means Other Regulated Materials.

"Outside container" means the outermost enclosure used in transporting a hazardous material other than a freight container.

"Overpack" means an enclosure not intended for reuse that is used by a single consignor to consolidate two or more packages for convenience in handling.

"Oxidizer" or "Oxidizing material" See § 173.151.

"Package" or "Outside Package" means a packaging plus its contents.

"Packaging" means the assembly of one or more containers and any other components necessary to assure com-

pliance with the minimum packaging requirements of this subchapter and includes containers (other than freight containers or overpacks), portable tanks, cargo tanks, tank cars, and multi-unit tank car tanks.

"Person" means an individual, firm, co-partnership, corporation, company, association, or joint-stock association, and includes any trustee, receiver, assignee, or personal representative thereof.

"Poison A" See § 173.326.

"Poison B" See § 173.343.

"Portable tank" means any packaging (except a cylinder having a 1000-pound or less water capacity) over 110 U.S. gallons capacity and designed primarily to be loaded into or on or temporarily attached to a transport vehicle or ship, and equipped with skids, mounting, or accessories to facilitate handling of the tank by mechanical means. It does not include any cargo tank, tank car tank, tank of the DOT-106A or 110A type, or trailers carrying 3AX, 3AAX, or 3T cylinders.

"Proper shipping name" means the name of the hazardous material shown in Roman print (not italics) in § 172.101 of this subchapter.

"P.s.i.a. or psia" means pounds per square inch absolute.

"P.s.g. or psig" means pounds per square inch gauge.

"Pyrophoric liquid" See § 173.115.

"Pyrophoric solid" See § 173.150.

"Radioactive materials" See § 173.389.

"Secretary of State" means the Secretary of State of Illinois.

"Sheathing" means a covering consisting of a smooth layer of wood placed over metal and secured to prevent any movement.

"Shipping paper" means a shipping order, bill of lading, manifest or other shipping document serving a similar purpose and containing the information required by §§ 172.202, 172.203 and 172.204.

"STC (single-trip container)" means a container that may not be refilled and re-shipped after having been previously emptied, except as provided in § 173.28.

"Solution" means any homogeneous liquid mixture of two or more chemical compounds or elements that will not undergo any segregation under conditions normal to transportation.

"Spontaneously combustible material (solid)" means a solid substance (including sludges and pastes) which may

undergo spontaneous heating or self-ignition under conditions normally incident to transportation or which may upon contact with the atmosphere undergo an increase in temperature and ignite.

"Strong outside container" means the outermost enclosure which provides protection against the unintentional release of its contents under conditions normally incident to transportation.

"Technical name" means a recognized chemical name currently used in scientific and technical handbooks, journals, and texts. Generic descriptions authorized for use as technical names are, Organic phosphate compound, Organic phosphorus compound, Organic phosphate compound mixture, Organic phosphorus compound mixture, Methyl parathion, and Parathion.

"TOFC" means trailer-on-flat-car.

"Transport vehicle" means a motor vehicle or rail car used for the transportation of cargo by any mode. Each cargo-carrying body (trailer, railroad freight car, etc.) is a separate transport vehicle.

"UFC" means Uniform Freight Classification.

"United States" means the fifty States, the District of Columbia, the Commonwealth of Puerto Rico, the Virgin Islands, American Samoa, or Guam.

"Viscous liquid" means a liquid material which has a measured viscosity in excess of 2500 centistokes at 25° C (77° F°) when determined in accordance with the procedures specified in ASTM Method D 445-72 "Kinematic Viscosity of Transparent and Opaque Liquids (and the Calculation of Dynamic Viscosity)" or ASTM Method D 1200-70 "Viscosity of Paints, Varnishes, and Lacquers for Ford Viscosity Corp."

"Volatility" refers to the relative rate of evaporation of materials to assume the vapor state.

"Water reactive material (solid)" means any solid substance (including sludges and pastes) which, by interaction with water, is likely to become spontaneously flammable or to give off flammable or toxic gases in dangerous quantities.

"Water resistant" means having a degree of resistance to permeability by and damage caused by water in liquid form.

"W.T." means watertight.

§ 171.9 Rules of construction.

(a) In this subchapter, unless the context requires otherwise: (1) Words imparting the singular include the plural;

(2) Words imparting the plural include the singular; and;

(3) Words imparting the masculine gender include the feminine;

(b) In this subchapter, the word: (1) "Shall" is used in an imperative sense;

(2) "Must" is used in an imperative sense;

(3) "Should" is used in a recommendatory sense;

(4) "May" is used in a permissive sense to state authority or permission to do the act described, and the words "no person may * * *" or "a person may not * * *" means that no person is required, authorized, or permitted to the act described; and

(5) "Includes" is used as a word of inclusion not limitation.

171.10 (Reserved)

§ 171.11 [Reserved]

§ 171.12 . Import and export shipments.

(a) Except in the case of a shipment from Canada conforming to § 173.8, each person importing a hazardous material into the United States shall provide the shipper and the forwarding agent at the place of entry into the United States timely and complete information as to the requirements of this subchapter that will apply to the shipment of the material within the United States. The shipper, directly or through the forwarding agent at the place of entry, shall provide the initial carrier in the United States the certificate of compliance required by § 172.204. The carrier may not accept the material for transportation unless the required certification is provided.

(b) The requirements of § 171.2 with respect to classification and labeling notwithstanding, a hazardous material (other than Class A explosives or radioactive materials) which is classed and labeled in accordance with the IMCO Code and being imported into or exported from the United States or passing through the United States in the course of being shipped between places outside the United States may be offered and accepted for transportation and transported within the United States if it is otherwise offered, accepted, and transported in accordance with this subchapter. When a material is transported

within the United States by air, highway, or rail under an IMCO class, the entry on the shipping paper required by § 172.202(a)(2) must include a class set forth in this subchapter that most appropriately corresponds to the IMCO class. For example, according to IMCO, the description and class for ethylene oxide is "Ethylene Oxide, 2" or "Ethylene Oxide, Gas 2.". While ethylene oxide in domestic transportation would be classed a flammable liquid, the class in this subchapter that most appropriately corresponds to the IMCO class is "flammable gas". The proper entry would therefore be "Ethylene Oxide, Flammable Gas" or "Ethylene Oxide, 2 Flammable Gas".

(c) The requirements of § 171.2 with respect to specification identification markings on packages notwithstanding, a package of hazardous materials (other than a compressed gas cylinder or a package of more than 110 gallons capacity) being imported into or exported from the United States or passing through the United States in the course of being shipped between places outside the United States may be offered and accepted for transportation and transported within the United States if the package specification identification markings required by Part 178 are clearly and legibly displayed on the surface of the package or on decals or tags securely affixed to the package, and the package is otherwise offered, accepted, and transported in accordance with this subchapter.

(d) Section 171.2 notwithstanding, a hazardous material (other than an explosive or a radioactive material) being imported into or exported from the United States or passing through the United States in the course of being shipped between places outside the United States may be offered and accepted for transportation and transported by motor vehicle within a single port area (including contiguous harbors) when packaged, marked, classed and labeled in accordance with the IMCO Code. If the hazardous material is offered and accepted in accordance with the requirements of Subparts C and F of Part 172 of this subchapter pertaining to shipping papers and placarding.

171.13 (Reserved)

§ 171.14 Specification markings.

(a) Packagings with the specification markings "ICC" placed thereon before January 1, 1970, may be continued in service as marked.

§ 171.15 Notification and reporting of hazardous material incidents.

(a) No special reporting requirements are required by these regulations, however, shippers and carriers are not relieved of their responsibilities to comply with the requirements of any other agency of the State or Federal Government.

§ 171.16 [Reserved]

PART 172—HAZARDOUS MATERIALS TABLE AND HAZARDOUS MATERIALS COMMUNICATIONS REGULATIONS

Subpart A—General

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172.1	Purpose and scope.
172.3	Applicability.

Subpart B—Table of Hazardous Materials, Their Description, Proper Shipping Name, Class, Label, Packaging, and Other Requirements.

172.100	Purpose and use of the table.
172.101	Hazardous materials table.

Subpart C—Shipping Papers

172.200	Applicability.
172.201	General entries.
172.202	Description of hazardous material on shipping papers.
172.203	Additional description, requirements.
172.204	Shipper's certification.
172.205	Permanent shipping papers.

Subpart D—Marking

172.300	General marking requirements.
172.302	[Reserved]
172.304	Marking requirements.
172.306	Consignee's or consignor's name and address.
172.308	Authorized abbreviations.
172.310	Radioactive materials.
172.312	Liquid hazardous materials.
172.316	[Reserved]
172.326	Portable tanks.
172.328	Cargo tanks.
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Subpart E—Labeling

Sec.	
172.400	General labeling requirements.
172.401	Prohibited labeling.
172.402	Additional labeling requirements.
172.403	Radioactive materials.
172.404	Labels for mixed and consolidated packaging.
172.405	Authorized label modifications.
172.406	Placement of labels.
172.407	Label specifications.
172.411	EXPLOSIVE A, EXPLOSIVE B, AND EXPLOSIVE C labels.
172.415	NON-FLAMMABLE GAS label.
172.416	POISON GAS label.
172.417	FLAMMABLE GAS label.
172.419	FLAMMABLE LIQUID label.
172.420	FLAMMABLE SOLID label.
172.422	SPONTANEOUSLY COMBUSTIBLE label.
172.423	DANGEROUS WHEN WET label.
172.426	OXIDIZER label.
172.427	ORGANIC PEROXIDE label.
172.430	POISON label.
172.432	IRRITANT label.
172.436	RADIOACTIVE WHITE-I label.
172.438	RADIOACTIVE YELLOW-II label.
172.440	RADIOACTIVE YELLOW-III label.
172.442	CORROSIVE label.
172.444	ETIOLOGIC AGENT label.
172.446	[Reserved]
172.448	[Reserved]
172.450	EMPTY label.

Subpart F—Placarding

172.500	Applicability of placarding requirements.
172.502	Prohibited placarding.
172.504	General placarding requirements.
172.506	Providing and affixing placards: Highway.
172.508	[Reserved]
172.510	[Reserved]
172.512	Freight container.
172.514	Cargo tanks and portable tanks.
172.516	Visibility and display of placards.
172.519	General specifications for placards.
172.521	DANGEROUS placard.
172.522	EXPLOSIVES A placard.
172.524	EXPLOSIVES B placard.
172.525	[Reserved]
172.527	[Reserved]
172.528	NON-FLAMMABLE GAS placard.

(e) Notwithstanding the quantity limitations of § 173.389(c) and (1) of this subchapter, any package of radioactive materials (except for fissile radioactive materials or Type B quantities under § 173.393b of this subchapter) which otherwise conform to the requirements of this subchapter applicable to Type A quantities or low specific activity materials may be offered and accepted for transportation and transported within Illinois if -

(1) The package is being imported into the United States, or is passing through in the course of being shipped between places outside the United States;

(2) The country of origin has adopted the Type A quantity limitations and low specific activity materials definition set forth in the IAEA Regulations for the Safe Transport of Radioactive Materials, 1973 Revised Edition; and

(3) The contents of the package have been limited as a Type A quantity or a low specific activity material in accordance with the IAEA Type A quantity limitations and low specific activity materials definition adopted by the originating country.

(Source: 7 Ill. Reg 3486, effective April 2, 1983)

§ 171.13 (RESERVED)

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§ 171.14 SPECIFICATION MARKINGS.

(a) Packagings with the specification markings "ICC" placed thereon before January 1, 1970, may be continued in service as marked.

§ 171.15 NOTIFICATION AND REPORTING OF HAZARDOUS MATERIAL INCIDENTS.

(a) No special reporting requirements are required by these regulations, however, shippers and carriers are not relieved of their responsibilities to comply with the requirements of any other agency of the State or Federal Government.

§ 171.16 (RESERVED)

§ 171.17 HAZARDOUS SUBSTANCE DISCHARGE NOTIFICATION.

(a) No special reporting requirements are required by these regulations, however, shippers and carriers are not relieved of their responsibilities to comply with the requirements of any other agency of the State or Federal Government.

(Source: 7 Ill. Reg 3486, effective April 2, 1983)

§ 171.18 CONTINUATION OF EFFECTIVENESS OF EXISTING BUREAU OF EXPLOSIVES REGISTRATIONS.

A registration filed with the Bureau of Explosives in compliance with a requirement of this subchapter, which is valid at the time that registration function is assumed by the MTB or MTB-TSC, remains valid to the same extent as if it had been filed originally with MTB or MTB-TSC.

(Source: 17 Ill. Reg 4287, effective April 16, 1982)

§ 171.19 APPROVALS OR AUTHORIZATIONS ISSUED BY THE BUREAU OF EXPLOSIVES.

Unless otherwise specifically restricted by other requirements of this subchapter, an approval or authorization issued by the Bureau of Explosives, which is valid at the time that approval or authorizing function is abolished or is assumed by the Associate Director for OE, remains valid under the conditions and for the period of time for which it was issued by the Bureau of Explosives. However, no such approval or authorization remains valid beyond December 31, 1984 unless reissued by the Associate Director for OE. The Associate Director for OE may amend or extend any approval or authorization issued by the Bureau of Explosives.

(Source: 17 Ill. Reg 4287, effective April 16, 1982)

**PART 172 HAZARDOUS MATERIALS TABLE AND
HAZARDOUS MATERIALS COMMUNICATIONS
REGULATIONS**

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Sec.

- 172.1 Purpose and scope.
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**Subpart B-Table of Hazardous Materials,
Their Description, Proper Shipping Name,
Class, Label, Packaging, and Other
Requirements**

- 172.101 Hazardous Materials Table.
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ments.
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and address.
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exemptions
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Supart E-Labeling

Sec.

- 172.400 General labeling requirements.
- 172.401 Prohibited labeling.
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- 172.403 Radioactive materials.
- 172.404 Labels for mixed and consolidated
packaging.
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- 172.411 EXPLOSIVE A, EXPLOSIVE B, EXPLOSIVE C,
AND BLASTING AGENTS labels.
- 172.415 NON-FLAMMABLE GAS label.
- 172.416 POISON GAS label.
- 172.417 FLAMMABLE GAS label.
- 172.419 FLAMMABLE LIQUID label.
- 172.420 FLAMMABLE SOLID label.
- 172.422 SPONTANEOUSLY COMBUSTIBLE label.
- 172.423 DANGEROUS WHEN WET label.
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- 172.427 ORGANIC PEROXIDE label.
- 172.430 POISON label.
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ments.
- 172.502 Prohibited placarding.
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Sec.	Sec.
172.527 (Reserved)	172.552 ORGANIC PEROXIDE placard.
172.528 NON-FLAMMABLE GAS placard.	172.554 POISON placard.
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172.542 FLAMMABLE placard and modification.	APPENDIX A-Specifications for colors.
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Authority: Illinois Revised Statutes, Chapter 95 1/2, Paragraphs 700-4(a) and 700-9(a).

(Source: 7 Ill. Reg 3486, effective April 2, 1983)

SUBPART A-GENERAL

§ 172.1 PURPOSE AND SCOPE.

This Part lists and classifies those materials which the U.S. Department of Transportation has designated as hazardous materials for purposes of transportation and which are, under the Act, regulated as a hazardous material when transported over highways in the State of Illinois. This Part also prescribes the requirements for shipping papers, package marking, labeling and placarding applicable to the shipment and transportation of those hazardous materials.

(Source: 17 Ill. Reg 4287, effective April 16, 1982)

§ 172.3 APPLICABILITY.

(a) This Part applies to -

(1) Each person who offers a hazardous material for transportation over highway in Illinois, and

(2) Each carrier by highway who transports a hazardous material over highway in Illinois.

(b) When a person, other than one of those provided for in paragraph (a) of this section, performs a packaging, labeling or marking function required by this Part, that person shall perform the function in accordance with this Part.

(Source: 17 Ill. Reg 4287, effective April 16, 1982)

SUBPART B-TABLE OF HAZARDOUS MATERIALS, THEIR DESCRIPTION, PROPER SHIPPING NAME, CLASS, LABEL, PACKAGING, AND OTHER REQUIREMENTS

§ 172.101 PURPOSE AND USE OF THE TABLE.

(a) The Hazardous Materials Table (Table) in this section designates the materials listed therein as hazardous materials for purposes of the transportation of those materials by highway in Illinois, identifies the hazard class of each listed material and specifies or references requirements set forth elsewhere in this subchapter pertaining to the labeling, packaging and transportation of those materials.

(b) Column 1 contains the four symbols as appropriate: Plus (+) and the letters "A", "W", and "E".

(1) The plus (+) fixes the proper shipping name and the hazard class for that entry without regard to whether the material meets the definition of that class. An alternate proper shipping name and hazard class may be authorized by the Associate Director, Office of Hazardous Materials Regulation, MTB.

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(2) A letter "A": references that the material is not regulated by the Department but is regulated by U.S. DOT when transported by aircraft, but a letter "A" has no significance or effect when -

(i) A letter "E" also appears with it and the material is a hazardous substance; or

(ii) The material is a hazardous waste.

(3) A letter "W" references that the material is not regulated by the Department but is regulated by U.S. DOT when transported by vessel, but a letter, "W" has no significance or effect when -

(i) A letter "E" also appears with it and the material is a hazardous substance; or

(ii) The material is a hazardous waste.

(4) A letter "E" identifies materials which are subject to the requirements of this subchapter, regardless of the mode of transportation or hazard class, if it is a hazardous substance (as defined in § 171.8 of this subchapter). A hazardous substance which does not meet the defining criteria for another hazard class remains subject to certain requirements of this subchapter as an ORM-E.

(c) Column 2 lists the proper shipping name of materials designated as hazardous materials. Modification of a proper shipping name may otherwise be required or authorized by this section (see paragraphs (b)(4), (c)(10), (c)(11), (c)(12) and (c)(13) of this section). Proper shipping names are limited to those shown in Roman type (not italics).

(1) Shipping names may be used in the singular or plural in either capital or lower case letters.

(2) The words in italics are not part of the proper shipping name but may be used in addition to the proper shipping name. The word "or" in italics indicates that any terms in the sequence may be used as the proper shipping name as appropriate.

(3) The abbreviation "n.o.i." which means "not otherwise indexed" or "n.o.i.b.n." which means "not otherwise indexed by name" may be used interchangeably with "n.o.s."

(4) Except for hazardous wastes, when qualifying words are used as part of the proper shipping name, their sequence on package markings and shipping paper descriptions is optional.

(5) Except for organic peroxides, when one entry references another entry by use of a "See", if both names are Roman type, either name may be used as a proper shipping name (e.g. Carboic acid. See Phenol).

For an organic peroxide, the technical name shall be used as the proper shipping name.

(6) The words "poison" or "poisonous" in this column refer to materials that would cause death by systemic poisoning rather than by corrosive destruction of tissue.

(7) When a shipping name includes a concentration range as part of the shipping description, the actual concentration being shipped, if it is within the range stated, may be used in place of the concentration range. For example: a hydrogen peroxide solution containing 30% peroxide may be shipped as either "Hydrogen peroxide solution (8% to 40% peroxide)" or "Hydrogen peroxide solution, 30% peroxide."

(8) The use of the prefix "mono" is optional in any shipping name when appropriate. Thus, Monoethanolamine may be used interchangeably with Ethanolamine. In "Difluoromonoethane" the term "mono" is considered as a prefix to the term "chloroethane" and may be deleted.

(9) The numbers in italics following a proper shipping name of a material identified by the letter "E" in Column 1 specify, in pounds and kilograms, the minimum quantity of the material that constitutes a reportable quantity, excluding water and other formulating materials. For example: Ammonia solution (RQ-1000/454) means that the reportable quantity for the Ammonia is 1,000 pounds or 454 kilograms. Any formulating material that is identified by the letter "E" in Column 1 of the Table to § 172.101 and used in a mixture or solution must be evaluated independently for the RQ determination. For example, if Mevinphos (RQ-1/0.454) is mixed with Xylene (RQ-1000/454) and is in a 10 lb. package described as "Organophosphorus pesticide, liquid, n.o.s.", Mevinphos could be in a reportable quantity, but there could not be a reportable quantity of the Xylene present in that package.

(10) If the word "waste" is not included in the hazardous material description in the Table, the proper shipping name for a hazardous waste must include the word "Waste" preceding the shipping name of the material. For example: Waste acetone.

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(11) A mixture or solution comprised of a hazardous material identified in the Table by technical name and non-hazardous material may be described using the proper shipping name of the hazardous material, if-

- (i) The mixture or solution is not specifically identified in the Table,
- (ii) The hazard class of the mixture or solution is the same as that of the hazardous material, and
- (iii) The qualifying word "mixture" or "solution", as appropriate, is added as part of the proper shipping name.

For example, a solution of Acetone, mineral oil, and water, meeting the definition of a flammable liquid, may be described under this optional provision as "Acetone solution. Flammable liquid, UN 1090."

(12) (Reserved)

(13) Except for proper shipping names in the Table that are preceded by a plus (+)-

(i) If it is specifically determined that a material meets the definition of a hazard class other than the class shown in association with the proper shipping name, the material must be described by an appropriate shipping name listed in association with the correct class for the material or-

(ii) If an appropriate technical name is not shown in the Table, selection of a proper shipping name must be made from the general descriptions or n.o.s. entries corresponding to the specific hazard class of the material being shipped. The name that most appropriately describes the material must be used e.g., an alcohol not listed by name in the Table must be shipped as "Alcohol, n.o.s." rather than "Flammable liquid, n.o.s." Some mixtures may be more appropriately described according to their application, such as "Compound, cleaning, liquid" or "Compound rust removing," rather than by an n.o.s. entry, such as "Corrosive liquid, n.o.s."

(iii) If a material meets the definition of more than one hazard class, and is not specifically identified in the Table, the hazard class of the material must be determined by using the precedence specified in § 173.2 of this subchapter, and an appropriate shipping description must be selected as described in paragraph (c)(13)(ii) of this section.

(iv) If it is specifically determined that a material is not a forbidden material and does not meet the definition of any hazard class, the material is not a hazardous material.

(d) Column 3 contains a designation of the hazard class corresponding to each proper shipping name or the word "Forbidden".

(1) A material for which the entry in this column is "Forbidden" is prohibited from being offered or accepted for transportation. This prohibition does not apply if these materials are diluted, stabilized, or incorporated in devices and they are classed in accordance with the definitions of hazardous materials contained in Part 173 of this subchapter.

(2) When re-evaluation of test data or new data indicates a need to modify the "Forbidden" designation or the hazard class specified for a material specifically identified in the Table, this data should be submitted to the Associate Director, Office of Hazardous Materials Regulation, MTB.

(3) Notwithstanding the ORM class shown for a material in Column 3, such a material having a flash point of 100°F. to 200°F. is classed as Combustible liquid when in a packaging having a rated capacity of more than 110 gallons.

(e) Column 3A lists the identification numbers assigned to hazardous materials. Those preceded by a "UN" are associated with descriptions considered appropriate for international shipments as well as domestic shipments. Those preceded by an "NA" are associated with descriptions that are not recognized for international shipments, except to and from Canada. If an identification number is in the "NA9000" series, it is either associated with the description of a material that is not appropriately covered by international hazardous materials (dangerous goods) shipping standards or not appropriately addressed by such standards for emergency response information purposes, except for transportation between the United States and Canada.

(f) Column 4 specifies the labels required to be applied to each package subject to the additional labeling requirements in § 172.402.

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(g) Column 5 references the applicable packaging section of Part 173. Exceptions from some of the requirements of this subchapter are noted in column 5(a). References to specific packaging requirements and exceptions other than those specified in 5(a) are noted in column 5(b).

** (h) Column 6 indicates the maximum net quantity in one package for air transportation or passenger railcar;

(1) Column 6(a) specifies the maximum net quantity permitted in one package for passenger-carrying aircraft or passenger railcar. For air transportation, any material forbidden on passenger-carrying aircraft but permitted on cargo aircraft, or which exceeds the maximum quantity authorized on passenger-carrying aircraft, must be shipped by cargo-only aircraft and bear the CARGO AIRCRAFT ONLY label.

(2) Column 6(b) lists the maximum net quantity for one outside package on cargo aircraft. Packaging must bear the CARGO AIRCRAFT ONLY label when the quantity of hazardous material exceeds that authorized on passenger-carrying aircraft, or is forbidden on passenger-carrying aircraft.

** (i) Column 7 specifies each of the authorized locations on board cargo vessels and passenger vessels and certain additional requirements for shipments of each listed hazardous material.

1. Stow separate from nitric acid or oxidizing materials.
2. Stow separate from nitric acid or oxidizing materials. Segregation same as for flammable liquids.
3. Shade from radiant heat. Stow away from corrosive materials.
4. Shade from radiant heat.
5. Keep dry. Glass carboys not permitted on passenger vessels.
6. Stow away from alcohols. Keep cool and dry. Separate longitudinally by an intervening complete compartment or hold from explosives.
7. Glass carboys in hampers not permitted under deck.
8. Keep cool.
9. Keep cool. Stow away from living quarters.
10. Keep cool and dry.
11. If flash point less than 141 deg. F. segregation same as for flammable liquids.
12. Keep dry. Separate longitudinally by an intervening complete hold or compartment from explosives. Segregation same as for corrosive materials.
13. Keep dry.
14. Segregation same as for flammable solid labeled Dangerous When Wet.
15. Keep dry. Segregation same as for flammable solids labeled Dangerous When Wet.
16. Stow away from acids and oxidizing materials.
17. Stow in well ventilated space.
18. Stow away from alkaline corrosives.
19. Keep away from heat.
20. Keep away from heat, acids, alum and salts of iron or zinc.
21. Stow away from powdered metals.
22. Separate from ammonium compounds and hydrogen peroxide. This material may be forbidden in water transportation by certain countries.
23. Stow away from heavy metals and their compounds.
24. Must not be accepted for transportation while hot. Separate by an intervening hold or compartment from Class A explosives. Separate from other explosives, corrosive materials, flammable solids, liquids, or gases, oxidizing materials, organic peroxides, or organic materials.
25. No other cargo may be stowed in the same hold with these items.
26. Do not accept unless returnable package notice is on drum and the instructions thereon have been carried out.

**These have been retained as guidance only for those shippers contemplating intermodal movement of hazardous materials. Refer to Parts 100-199 of Title 49 of the Code of Federal Regulations.

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27. Stow and handle to avoid airborne particles.
28. When applicable, no fire or residue thereof may be present in the furnace heating the substance while the vehicle is on board a cargo vehicle.
29. Separate from flammable gases or liquids, oxidizing materials, or organic peroxides.
30. Stow away from heavy metals.
31. Separate from ammonium compounds. Stow away from powdered metals.
32. Stow away from acids.
33. Separate from ammonium compounds and hydrogen peroxide.
34. Portable magazine or metal locker. Do not stow blasting caps with any high explosive. Do not handle blasting caps at the same time high explosives are being loaded.
35. Magazine. Do not stow blasting caps with any high explosives. Do not handle blasting caps at the same time high explosives are being loaded.
36. Do not stow blasting caps with any high explosive. Do not handle blasting caps at the same time high explosives are being loaded.
37. Keep dry. Stow separate from flammable liquids and acids. (Stow away from oils, grease, and similar organic materials).
38. Stow in well ventilated space. Shade from radiant heat. Segregation same as for nonflammable gases.
39. Stow away from living quarters and foodstuffs.
40. Provide cool stowage in a compartment having a temperature not exceeding 130° F., well away from any sources of heat, and in position to protect or move, even to jettison in event of fire. Separate from explosives, flammable liquids or gases, oxidizing materials, organic peroxides, or corrosives liquids.
41. Shade from radiant heat. Segregation same as for corrosives.
42. Segregation same as for flammable liquids.
43. Keep dry. Stow away from organic liquids.
44. Stow away from living quarters.
45. If stowed under deck, must be stowed in a recoverable location.
46. Keep dry. Stow away from copper, its alloys, and salts.
47. Separate from ammonium compounds. Stow away from powdered metals and cyanide.
48. Stow away from corrosive liquids. Keep dry.
49. Keep cool and dry. Segregation same as for flammable solids labeled Dangerous When Wet.
50. Keep dry. Stow away from explosives, acids, combustible materials, and ammonium salts.
51. Keep cool. Stow separate from combustible materials, explosives, or acids.
52. Keep cool. Not permitted on any vessel transporting explosives.
53. Stow away from open ventilators. Stow away from cyanides or cyanide mixtures, liquid or dry.
54. Stow away from living quarters and foodstuffs. Bulk shipments permitted in tight vans or containers only on cargo vessels (Castor beans only).
55. Forbidden.
56. See correct shipping name of applicable Poison B material for stowage, special handling, and special segregation requirements.
57. See correct shipping name of applicable Irritant material for stowage, special handling, and special segregation requirements.
58. See correct shipping name of applicable Poison A material for stowage, special handling, and special segregation requirements.
59. Stow in a well-ventilated space. Stow away from organic materials.
60. Stow away from foodstuffs.
61. Stow away from foodstuffs. Stow separate from flammable liquids and solids.
62. Not subject to requirements of Part 176.
63. Segregation same as for flammable solids. Separate from flammable gases or liquids, oxidizing materials, or organic peroxides.

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64. For material that meets only the corrosion to skin criteria of 49 CFR § 173.240(a)(1), "under deck" stowage is also authorized if the description includes the additional entry specified by § 172.203(i)(3).

65. Segregation same as for flammable solids. See 49 CFR §§ 176.900 to 176.904.

66. Keep dry. Stow away from vegetable or animal oils. See 49 CFR §§ 176.900 to 176.904.

67. Keep dry. Stow away from acids.

68. Keep dry. Segregation same as for corrosives.

69. Keep dry. Separate from corrosive and oxidizing materials, and organic peroxides.

70. Stow away from heavy metals and their compounds. If flash point is 141° F. or less segregation same as for flammable liquids.

71. Not permitted in unventilated containers.

72. Segregation same as for flammable gases.

73. Not permitted except under specific conditions approved by the Department.

74. Stow away from organic, corrosive, or oxidizing materials.

75. Magazine stowage authorized. No other cargo may be stowed in the same hold with these items.

76. Stow in cool, dry, well ventilated compartment. Do not stow bags over ten tiers high without flooring off. Do not overstow.

77. Keep dry. Stow away from living quarters.

78. Keep dry. Stow away from living quarters. Segregation same as for flammable solids labeled Dangerous When Wet.

79. Stow away from animal or vegetable oils. Segregation same as for flammable solids.

80. Stow away from other flammable cargo or substances.

81. Passenger vessels in metal lockers only.

82. Passenger vessels in metal lockers only. Toy torpedoes must not be packed with other special fireworks.

83. Segregation same as for flammable solids. Separate from flammable gases or liquids, oxidizing materials, or organic peroxides. Use double strip stowage for cargo 6-12 percent moisture containing not more than 12 percent fat. Use single strip stowage for cargo 6-12 percent moisture containing 12-15 percent fat.

84. Glass carboys not permitted.

85. None.

86. Separate from nitro-compounds, chlorates, and acids.

87. Forbidden for water shipment.

88. Segregation same as for corrosives.

89. Glass carboys not permitted on passenger vessel.

90. Shade from radiant heat. Aqueous solutions containing more than 20 percent hydrogen cyanide are not permitted in transportation by water.

91. Segregation same as for nonflammable gases.

92. Shade from radiant heat. Separate from permanganates. Keep away from powdered metals.

93. Shade from radiant heat. Separate from permanganates. Keep away from powdered metals. Concentrations greater than 60 percent hydrogen peroxide not permitted on any vessel except under conditions approved by the Department.

94. Segregation same as for corrosive materials.

95. Keep tightly closed.

96. Stow in well ventilated space away from living quarters.

97. Keep dry. Not permitted if temperature of material is at or above 130° F.

98. Stow away from living quarters. Segregation same as for nonflammable gas.

99. Stow separate from oxidizing materials and corrosives.

100. Stow away from mercury and its compounds.

101. Segregation same as for flammable solids.

102. Not permitted on a vessel carrying explosives. Shade from radiant heat. Segregation same as for flammable liquids 1a*.

103. Segregation same as for corrosive materials.

104. Stow away from hydrazine, separate from diethylenetriamine.

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105. Segregation same as for corrosive materials. Stow away from hydrazine, separate from diethylenetriamine.
106. Segregation same as for nonflammable gases. Stow away from organic materials.
107. Under deck stowage must be in well-ventilated space.
108. Under deck stowage must be in metal drums only. Keep dry.
109. Stow separate from combustible materials, explosives, or acids.
110. Stow separate from acetylene. Do not overstuff with other cargo.
111. Segregation same as for corrosive materials. Stow away from hydrazine.
112. Separate from ammonium compounds, hydrogen peroxide, and acids.
113. Not permitted if temperature of material is at or above 130° F.
114. Keep dry. Glass bottles not permitted under deck.
115. Separate from oxidizing materials.
116. Under deck stowage permitted on cargo vessels if wet with more than 30% water. Stow away from heavy metals and their compounds.
117. Keep dry. Do not stow with metals or alloys such as brass, copper, tin, zinc, aluminum, solder, or lead.
118. Separate from ammonium compounds and cyanides. Stow away from foodstuffs.
119. Separate from liquid acids, flammable gases or liquids, oxidizing materials or organic peroxides.
120. Magazine stowage authorized.
121. Separated by a complete compartment or hold from organic peroxides.
122. Shade from radiant heat. Separate from flammable gases or liquids, oxidizing materials, or organic peroxides.
123. Keep dry. Separate from flammable gases, or liquids, oxidizing materials, or organic peroxides.
124. Separate from flammable gases or liquids, oxidizing materials, or organic peroxides. Temperature of tankage must not exceed 100° F.
125. Segregation same as for explosives.
126. Stow away from heavy metals, especially lead and its compounds. Stow separate from acids.
127. Keep dry. Below deck stowage in metal drums only. Separate from flammable gases, liquids, oxidizing materials, or organic peroxides.
128. Stow separate from ammonium compounds and cyanides.
129. Stow separate from ammonium compounds and cyanides. Bagged material not permitted on passenger vessels.
130. Keep dry. Stow away from powdered metals, permanganates, combustible packing of other cargo, and combustible foodstuffs.
131. Stow away from heavy metals, especially lead, and its compounds.
132. Under deck stowage must be readily accessible. Segregation same as for flammable solids labeled Dangerous When Wet.
133. Stow separate from liquid acids. Separate from flammable gases or liquids, oxidizing materials or organic peroxides.
134. Protect from sparks and open flame. Stow separate from oxidizing materials. Segregation same as for flammable solids.
135. Keep dry. Under deck stowage is permitted on cargo vessels only in metal drums.
136. Shade from radiant heat. Stow away from living quarters. Segregation same as for nonflammable gases.
137. If flash point is 141° F. or less, segregation must be the same as for flammable liquids.
138. Shade from radiant heat. Stow away from foodstuffs.
139. Separate longitudinally by a complete hold or compartment from explosives.
140. Shade from radiant heat. Keep dry.
141. Separate longitudinally by an intervening hold or compartment from explosives.
142. This material may be forbidden in water transportation by certain countries.
143. Keep away from oxidizing agents.
144. Stow away from heavy metals and their salts.
145. Separate from chlorine and materials bearing the oxidizer label.

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146. Stow away from ammonium compounds and away from powdered metals.

147. Under deck stowage is permitted on cargo vessels only in metal drums.

148. Do not stow detonating primers, Class A explosives with any high explosives. Do not handle at the same time high explosives are being loaded.

149. The maximum net quantity in one package for this material shipped aboard passenger vessel is limited to 50 pounds. Must not be stowed in portable magazine for metal locker. Do not stow detonating primers, Class C explosives with high explosives. Do not handle at the same time high explosives are being loaded.

150. Do not stow detonators, Class A with any high explosives. do not handle at the same time high explosives are being loaded.

151. The maximum net quantity in one package for this material shipped aboard passenger vessel is limited to 50 pounds. Must be stowed in portable magazine or metal locker. Do not stow detonators, Class C explosives with high explosives. Do not handle at the same time high explosives are being loaded.

152. Stow away from acids and oxidizers.

153. Separate from ammonium compounds, powdered materials, and cyanides.

154. Stow away from living quarters and organic materials.

(j) If any entry in the Table is changed by an amendment to this subchapter, such a change does not apply to the shipment of any package filled prior to the effective date of the amendment, unless specifically stated otherwise in the amendment or the "Effective date" entry in its preamble.

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ILLINOIS HAZARDOUS MATERIALS TRANSPORTATION REGULATIONS

§172.101 HAZARDOUS MATERIALS TABLE

(1) +/ E/ A/ W/	(2) Hazardous materials descriptions and proper shipping names	(3) Hazard class	(3A) ID Number	(4) Label(s) required (if not excepted)	(5) Packaging		(6) Maximum net quantity in one package		(7) Water Shipments		
					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
	Accumulator, pressurized (pneumatic or hydraulic), containing nonflammable gas	Non-flammable gas	NA1956	Non-flammable gas	173.306		No Limit	No limit	1,2	1,2	
	Acetal	Flammable liquid	UN1088	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,3	4	
E	Acetaldehyde (ethyl aldehyde) (RQ-1000/454)	Flammable liquid	UN1089	Flammable liquid	None	173.119	Forbidden	10 gallons	1,3	5	
EA	Acetaldehyde ammonia (RQ-1000/454)	ORM-A	UN1841	None	173.505	173.510	No limit	No limit	1,2	1,2	
E	Acetic acid (aqueous solution) (RQ-1000/454)	Corrosive material	UN2790	Corrosive	173.244	173.245	1 quart	10 gallons	1,2	1,2	1
E	Acetic acid, glacial (RQ-1000/454)	Corrosive material	UN2789	Corrosive	173.244	173.245	1 quart	10 gallons	1,2	1,2	2
E	Acetic anhydride (RQ-1000/454)	Corrosive material	UN1715	Corrosive	173.244	173.245	1 quart	1 gallon	1,2	1,2	
	Acetone	Flammable liquid	UN1090	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,3	4	
E	Acetone cyanohydrin (RQ-10/4.54)	Poison B	UN1541	Poison	None	173.346	Forbidden	55 gallons	1	5	3
	Acetone oil	Flammable liquid	UN1091	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	Acetonitrile	Flammable liquid	NA1648	Flammable liquid	173.118	173.119	1 quart	10 gallons	1	4	4
	Acetyl acetone peroxide, in solution with not more than 9% by weight active oxygen. See Organic peroxide, liquid or solution, n.o.s.		UN2080								
	Acetyl acetone peroxide with more than 9% by weight active oxygen	Forbidden									
	Acetyl benzoyl peroxide, not more than 40% in solution. See Acetyl benzoyl peroxide solution, not over 40% peroxide		UN2081								
	Acetyl benzoyl peroxide, solid or more than 40% in solution	Forbidden									
	Acetyl benzoyl peroxide solution, not over 40% peroxide	Organic peroxide	UN2081	Organic peroxide	None	173.222	Forbidden	1 quart	1,2	1	
E	Acetyl bromide (RQ-5000/2270)	Corrosive material	UN1716	Corrosive	173.244	173.247	1 quart	1 gallon	1	1	5
E	Acetyl chloride (RQ-5000/2270)	Flammable liquid	UN1717	Flammable liquid	173.244	173.247	1 quart	1 gallon	1	1	6
	Acetyl cyclohexanesulfonyl peroxide, more than 82%, wetted with less than 12% water	Forbidden									
	Acetyl cyclohexanesulphonyl peroxide, not more than 82%, wetted with not less than 12% water. See Organic peroxide, solid, n.o.s.		UN2082								
	Acetyl cyclohexanesulphonyl peroxide, not more than 32% in solution. See Organic peroxide, liquid or solution, n.o.s.		UN2083								
	Acetylene	Flammable gas	UN1001	Flammable gas	None	173.303	Forbidden	300 pounds	1	1	4

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(1) +/ E/ A/ W/	(2) Hazardous materials descriptions and proper shipping names	(3) Hazard class	(3A) ID Number	(4) Label(s) required (if not excepted)	(5) Packaging		(6) Maximum net quantity in one package		(7) Water Shipments		
					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
A	Acetylene (liquid)	Forbidden									
	Acetylene silver nitrate	Forbidden									
	Acetylene tetrabromide	ORM-A	UN2504	None	173.505	173.510	10 gallons	55 gallons			
	Acetyl iodide	Corrosive material	UN1898	Corrosive	173.244	173.247	1 quart	1 gallon	1	1	5
	Acetyl peroxide, not more than 25% in solution. See Acetyl peroxide solution, not over 25% peroxide		UN2084								
	Acetyl peroxide, solid, or more than 25% in solution	Forbidden									
	Acetyl peroxide solution, not over 25% peroxide	Organic peroxide	UN2084	Organic peroxide	173.153	173.222	Forbidden	1 quart	1,2	1	
	Acid butyl phosphate	Corrosive material	UN1718	Corrosive	173.244	173.245	1 quart	5 gallons	1,2	1,2	7
	Acid carboy, empty. See Carboy, empty.										
	Acid, liquid, n.o.s.	Corrosive material	NA1760	Corrosive	173.244	173.245	1 quart	5 pints	1	4	8
+E	Acid, sludge	Corrosive material	UN1906	Corrosive	None	173.248	Forbidden	1 quart	1,2	1	
	Acrolein, inhibited (RQ-1/0 .454)	Flammable liquid	UN1092	Flammable liquid and Poison	None	173.122	Forbidden	1 quart	1,2	5	9
	Acrylic acid	Corrosive material	UN2218	Corrosive	173.244	173.245	1 quart	5 pints	1	1	
E	Acrylonitrile (RQ-100/45.4)	Flammable liquid	UN1093	Flammable liquid and Poison	None	173.119	Forbidden	1 quart	1,2	5	8
E	Actuating cartridge, explosive (fire extinguisher, or valve)	Class C explosive		Explosive C	173.114		50 pounds	150 pounds	1,2	1,2	10
	Adhesive, n.o.s. See Cement, liquid, n.o.s.										
	Adipic acid (RQ-5000/2270)	ORM-E	NA9077	None	None	173.510	No limit	No limit	1,2	1,2	
	Aerosol product. See Compressed gas, n.o.s.										
	Air, compressed	Non- flammable gas	UN1002	Non- flammable gas	173.306	173.302	150 pounds	300 pounds	1,2	1,2	
	Air conditioning machine. See Refrigerating machine										
	Aircraft rocket engine (Com- mercial)	Flammable solid	NA2791	Flammable solid	None	173.238	Forbidden	550 pounds	1,3	5	
	Aircraft rocket engine igniter (Commercial)	Flammable solid	UN2792	Flammable solid	None	173.238	Forbidden	25 pounds	1,3	5	
	Airplane flares. See Fireworks, special										
	Alcoholic beverage	Flammable liquid	UN1170	Flammable liquid	173.118	173.125	See 173.118(C)	10 gallons	1,2	1	
	Alcoholic beverage	Combusti- ble liquid	UN1170	None	173.118a	None	No limit	No limit	1,2	1,2	
	Alcohol, n.o.s.	Flammable liquid	UN1987	Flammable liquid	173.118	173.125	1 quart	10 gallons	1,2	1	

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§172.101 HAZARDOUS MATERIALS TABLE

(1) +/ E/ A/ W/	(2) Hazardous materials descriptions and proper shipping names	(3) Hazard class	(3A) ID Number	(4) Label(s) required (if not excepted)	(5) Packaging		(6) Maximum net quantity in one package		(7) Water Shipments		
					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
	Alcohol, n.o.s.	Combust- ible liquid	UN1987	None	173.118a	None	No limit	No limit	1,2	1,2	
E	Aldrin (RQ-1/0.454)	Poison B	NA2761	Poison	173.364	173.376	50 pounds	200 pounds	1,2	1,2	
EA	Aldrin, cast solid (RQ-1/0.454)	ORM-A	NA2761	None	173.505	173.510	No limit	No limit	1,2	1,2	
E	Aldrin mixture, dry (with more than 65% aldrin) (RQ-1/0.454)	Poison B	NA2761	Poison	173.364	173.376	50 pounds	200 pounds	1,2	1,2	
EA	Aldrin mixture, dry, with 65% or less aldrin (RQ-1/0.454)	ORM-A	NA2761	None	173.505	173.510	No limit	No limit	1,2	1,2	
E	Aldrin mixture, liquid (with more than 60% aldrin) (RQ-1/0.454)	Poison B	NA2762	Poison	173.345	173.361	1 quart	55 gallons	1,2	1,2	11
EA	Aldrin mixture, liquid, with 60% or less aldrin (RQ-1/0.454)	ORM-A	NA2762	None	173.505	173.510	No limit	No limit	1,2	1,2	
	Alkaline (corrosive) liquid n.o.s.	Corrosive material	NA1719	Corrosive	173.244	173.249	1 quart	5 gallons	1,2	1,2	
	Alkaline battery fluid	Corrosive material	UN2797	Corrosive	173.244	173.249 173.257	1 quart	5 gallons	1,2	1,2	
	Alkaline battery fluid with empty storage battery	Corrosive material	NA2797	Corrosive	None	173.258	Forbidden	5 pints	1,2	1,2	
	Alkanesulfonic acid	Corrosive material	UN2584	Corrosive	173.244	173.245	5 pints	1 gallon	1,2	1	
	Alkyl aluminum halides. See Pyrophoric liquid, n.o.s.										
A	Allethrin	ORM-A	NA2902 NA2909	None	173.505	173.510	No limit	No limit			
E	Allyl alcohol (RQ-100/45.4)	Flammable liquid	UN1098	Flammable liquid and Poison	173.118	173.119	1 quart	10 gallons	1,2	1	
	Allyl bromide	Flammable liquid	UN1099	Flammable liquid	173.118	173.119	Forbidden	10 gallons	1,2	1	
E	Allyl chloride (RQ-1000/454)	Flammable liquid	UN1100	Flammable liquid	None	173.119	Forbidden	10 gallons	1,3	5	
	Allyl chlorocarbonate	Flammable liquid	UN1722	Flammable liquid	None	173.288	Forbidden	5 pints	1	5	12
	Allyl chloroformate. See Allyl chlorocarbonate										
	Allyl trichlorosilane	Corrosive material	UN1724	Corrosive	None	173.280	Forbidden	10 gallons	1	1	13
	Aluminum alkyl. See Pyrophoric liquid, n.o.s.										
	Aluminum bromide, anhydrous	Corrosive material	UN1725	Corrosive	173.244	173.245b	25 pounds	100 pounds	1,2	1,2	13
	Aluminum dross, wet or hot. See 173.173	Forbidden									
	Aluminum hydride	Flammable solid	UN2463	Flammable solid and Dangerous when wet	None	173.206	Forbidden	25 pounds	1,2	5	14
	Aluminum, liquid. See Paint, Enamel, Lacquer, Stain, Shellac, Varnish, etc.										

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(1) +/ E/ A/ W/	(2) Hazardous materials descriptions and proper shipping names	(3) Hazard class	(3A) ID Number	(4) Label(s) required (if not excepted)	(5) Packaging		(6) Maximum net quantity in one package		(7) Water Shipments		
					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
	Aluminum, metallic, powder	Flammable solid	UN1396	Flammable solid	173.232	173.232	25 pounds	100 pounds	1,2	1,2	15
	Aluminum nitrate	Oxidizer	UN1438	Oxidizer	173.153	173.182	25 pounds	100 pounds	1,2	1,2	
	Aluminum phosphate solution	Corrosive material	NA1760	Corrosive	173.244	173.245	1 quart	10 gallons	1,2	1,2	
	Aluminum phosphide	Flammable solid	UN1397	Flammable solid and Dangerous when wet	None	173.154	Forbidden	25 pounds	1,2	1,2	16
E	Aluminum sulfate, solid (RQ-5000/2270)	ORM-E	NA9078	None	None	173.510	No limit	No limit	1,2	1,2	
EA	Aluminum sulfate solution (RQ-5000/2270)	ORM-E	NA1760	None	173.505	173.510	25 pounds	100 pounds	1,2	1,2	
	Amatol. See High explosive										
	2-(2-Aminoethoxy) ethanol	Corrosive material	NA1760	Corrosive	173.244	173.245	1 quart	10 gallons	1,2	1,2	
	N-Aminoethylpiperazine	Corrosive material	UN2815	Corrosive	173.244	173.245	1 quart	10 gallons	1,2	1,2	
	Aminopropyl diethanolamine	Corrosive material	NA1760	Corrosive	173.244	173.245	1 quart	10 gallons	1,2	1,2	
	N-Aminopropylmorpholine	Corrosive material	NA1760	Corrosive	173.244	173.245	1 quart	10 gallons	1,2	1,2	
	bis (Aminopropyl) piperazine	Corrosive material	NA1760	Corrosive	173.244	173.245	1 quart	10 gallons	1,2	1,2	
E	Ammonia, anhydrous (RQ-100/ 45.4)	Non- flammable gas	UN1005	Non- flammable gas	173.306	173.304 173.314 173.315	Forbidden	300 pounds	1,2	4	17
E	Ammonia solution (containing more than 44% ammonia) (RQ-1000/454)	Non- flammable gas	UN2073	Non- flammable gas	173.306	173.304 173.314 173.315	Forbidden	300 pounds	1,2	4	17
	Ammonia solution (containing 44% or less ammonia in water). See Ammonium hydroxide										
E	Ammonium acetate (RQ-5000/2270)	ORM-E	NA9079	None	None	173.510	No limit	No limit	1,2	1,2	
	Ammonium arsenate, solid	Poison B	UN1546	Poison	173.364	173.365	50 pounds	200 pounds	1,2	1,2	18
	Ammonium azide	Forbidden									
E	Ammonium benzoate (RQ-5000/2270)	ORM-E	NA9080	None	None	173.510	No limit	No limit	1,2	1,2	
E	Ammonium bicarbonate (RQ-5000/ 2270)	ORM-E	NA9081	None	None	173.510	No limit	No limit	1,2	1,2	
E	Ammonium bifluoride, solid or solution. See Ammonium hydrogen fluoride, solid or solution										
EA	Ammonium bisulfite, solid (RQ-5000/2270)	ORM-B	NA2693	None	173.505	173.510	25 pounds	100 pounds	1,2	1,2	
E	Ammonium bisulfite solution (RQ-5000/2270)	Corrosive material	NA2693	Corrosive	173.244	173.245	1 quart	5 gallons	1,2	1,2	
	Ammonium bromate	Forbidden									
EA	Ammonium carbamate (RQ-5000/ 2270)	ORM-A	NA9083	None	173.505	173.510	50 pounds	No limit	1,2	1,2	19
EA	Ammonium carbonate (RQ-5000/ 2270)	ORM-A	NA9084	None	173.505	173.510	50 pounds	No limit	1,2	1,2	20

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(1) +/ E/ A/ W/	(2) Hazardous materials descriptions and proper shipping names	(3) Hazard class	(3A) ID Number	(4) Label(s) required (if not excepted)	(5) Packaging		(6) Maximum net quantity in one package		(7) Water Shipments		
					(a)	(b)	(a)	(b)	(a)	(b)	(c)
					Excep- tions	Specific require- ments	Passenger carrying aircraft or railcar	Cargo only aircraft	Cargo vessel	Pas- senger vessel	Other require- ments See Sec. 172.101(i)
	<i>Ammonium chlorate</i>	Forbidden									
E	Ammonium chloride (RQ-5000/454)	ORM-E	NA9085	None	None	173.510	No limit	No limit	1,2	1,2	
E	Ammonium chromate (RQ-1000/454)	ORM-E	NA9086	None	None	173.510	No limit	No limit	1,2	1,2	
E	Ammonium citrate dibasic (RQ-5000/2270)	ORM-E	NA9087	None	None	173.510	No limit	No limit	1,2	1,2	
E	Ammonium dichromate (<i>ammonium bichromate</i>) (RQ-1000/454)	Oxidizer	UN1439	Oxidizer	173.153	173.154 173.235	25 pounds	100 pounds	1,2	1,2	
EA	Ammonium fluoborate (RQ-5000/2270)	ORM-B	NA9088	None	None	173.510	25 pounds	100 pounds	1,2	1,2	
EA	Ammonium fluoride (RQ-5000/2270)	ORM-B	UN2505	None	173.505	173.800	25 pounds	100 pounds	1,2	1,2	
	<i>Ammonium fulminate</i>	Forbidden									
E	Ammonium hydrogen fluoride, solid (RQ-5000/2270)	Corrosive material	UN1727	Corrosive	173.244	173.245b	25 pounds	100 pounds	1,2	1,2	13
E	Ammonium hydrogen fluoride solution (RQ-5000/2270)	Corrosive material	UN2817	Corrosive	173.244	173.245	1 quart	5 gallons	1,2	1,2	13
A	Ammonium hydrogen sulfate	ORM-B	UN2506	None	173.505	173.800	25 pounds	100 pounds			
A	Ammonium hydrosulfide solution	ORM-A	NA2683	None	173.505	173.605	10 gallons	55 gallons			
E	Ammonium hydroxide (containing not less than 12% but not more than 44% ammonia) (RQ-1000/454)	Corrosive material	NA2672	Corrosive	173.244	173.245	2 gallons	2 gallons	1	4	
EA	Ammonium hydroxide (containing less than 12% ammonia) (RQ-5000/2270)	ORM-A	NA2672	None	173.505	173.510	10 gallons	55 gallons	1	1	
	Ammonium nitrate - carbonate mixture	Oxidizer	UN2068	Oxidizer	173.153	173.182	25 pounds	100 pounds	1,2	1,2	
	Ammonium nitrate - fertilizer, containing no more than 0.2% carbon	Oxidizer	UN2067	Oxidizer	173.153	173.182	25 pounds	100 pounds	1,2	1,2	
	Ammonium nitrate - fuel oil mixture. See High explosive										
	Ammonium nitrate - fuel oil mixture (Containing only prilled ammonium nitrate and fuel oil)	Blasting agent		Blasting agent	None	173.114a	Forbidden	100 pounds	1,2	1,2	
	Ammonium nitrate mixed fertilizer	Oxidizer	UN2069	Oxidizer	173.153	173.182	25 pounds	100 pounds	1,2	1,2	
	Ammonium nitrate (no organic coating)	Oxidizer	UN1942	Oxidizer	173.153	173.182	25 pounds	100 pounds	1,2	1,2	
	Ammonium nitrate (organic coating)	Oxidizer	NA1942	Oxidizer	173.153	173.182	25 pounds	100 pounds	1,2	1,2	
	Ammonium nitrate - phosphate	Oxidizer	UN2070	Oxidizer	173.153	173.182	25 pounds	100 pounds	1,2	1,2	
	Ammonium nitrate, solution (containing not less than 15% water). See 173.154(a)(17) and 173.154(a)(18)	Oxidizer	UN2426	Oxidizer							

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(1) +/ E/ A/ W/	(2) Hazardous materials descriptions and proper shipping names	(3) Hazard class	(3A) ID Number	(4) Label(s) required (if not excepted)	(5) Packaging		(6) Maximum net quantity in one package		(7) Water Shipments		
					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
	<i>Ammonium nitrite</i>	Forbidden									
E	Ammonium oxalate (RQ-5000/2270)	ORM-A	NA2449	None	173.505	173.510	50 pounds	200 pounds	1,2	1,2	
	Ammonium perchlorate	Oxidizer	UN1442	Oxidizer	173.153	173.239a	25 pounds	100 pounds	1,2	4	21
	Ammonium perchlorate. See High explosives										
	Ammonium permanganate	Oxidizer	NA9190	Oxidizer	None	173.154	Forbidden	Forbidden	1,2	1,2	22
	Ammonium picrate, dry. See High explosive										
	Ammonium picrate, wet (with 10% or more water)	Flammable solid	UN1310	Flammable solid	173.192		1 pound	1 pound	1	4	23
	Ammonium picrate, wet, with 10% or more water, over 16 ounces in one outside packaging. See High explosive										
A	Ammonium polysulfide solution	ORM-A	UN2818	None	173.505	173.605	10 gallons	55 gallons			
EA	Ammonium silicofluoride (RQ-1000/454)	ORM-B	UN2854	None	173.505	173.510	25 pounds	100 pounds	1,2	1,2	
E	Ammonium sulfamate (RQ-5000/2270)	ORM-E	NA9089	None	None	173.510	No limit	No limit	1,2	1,2	
W	Ammonium sulfate nitrate	ORM-C	NA1477	None	173.505	173.910			1,2	1,2	24
E	Ammonium sulfide solution (RQ-5000/2270)	Flammable liquid	UN2683	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1,2	
E	Ammonium sulfite (RQ-5000/2270)	ORM-E	NA9090	None	None	173.510	No limit	No limit	1,2	1,2	
E	Ammonium tartrate (RQ-5000/2270)	ORM-E	NA9091	None	None	173.510	No limit	No limit	1,2	1,2	
E	Ammonium thiocyanate (RQ-5000/2270)	ORM-E	NA9092	None	None	173.510	No limit	No limit	1,2	1,2	
E	Ammonium thiosulfate (RQ-5000/2270)	ORM-E	NA9093	None	None	173.510	No limit	No limit	1,2	1,2	
	Ammunition, chemical (containing a Poison A liquid or gas). See Chemical ammunition, nonexplosive (containing a Poison A material)										
	Ammunition, chemical (containing a Poison B material). See Chemical ammunition, nonexplosive (containing a Poison B material)										
	Ammunition, chemical (containing an irritating liquid or solid). See Chemical ammunition, nonexplosive (containing an irritating material)										
	Ammunition, chemical, explosive, with Poison A material	Class A explosive		Explosive A and Poison gas	None	173.59	Forbidden	Forbidden	6	5	25
	Ammunition, chemical, explosive, with Poison B material	Class A explosive		Explosive A and Poison	None	173.59	Forbidden	Forbidden	6	5	25
	Ammunition, chemical, explosive, with irritant	Class A explosive		Explosive A and Irritant	None	173.59	Forbidden	Forbidden	6	5	25
	Ammunition for cannon with empty projectile	Class B explosive		Explosive B	None	173.89	Forbidden	Forbidden	1,2	5	
	Ammunition for cannon with explosive projectile	Class A explosive		Explosive A	None	173.54	Forbidden	Forbidden	6	5	

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(1) +/ E/ A/ W/	(2) Hazardous materials descriptions and proper shipping names	(3) Hazard class	(3A) ID Number	(4) Label(s) required (if not excepted)	(5) Packaging		(6) Maximum net quantity in one package		(7) Water Shipments		
					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
	Ammunition for cannon with gas projectile	Class A explosive		Explosive A	None	173.54	Forbidden	Forbidden	6	5	
	Ammunition for cannon with illuminating projectile	Class A explosive		Explosive A	None	173.54	Forbidden	Forbidden	6	5	
	Ammunition for cannon with incendiary projectile	Class A explosive		Explosive A	None	173.54	Forbidden	Forbidden	6	5	
	Ammunition for cannon with inert loaded projectile	Class B explosive		Explosive B	None	173.89	Forbidden	Forbidden	1,2	5	
	Ammunition for cannon without projectile	Class B explosive		Explosive B	None	173.89	Forbidden	Forbidden	1,2	5	
	Ammunition for cannon with smoke projectile	Class A explosive		Explosive A	None	173.54	Forbidden	Forbidden	6	5	
	Ammunition for cannon with solid projectile	Class B explosive		Explosive B	None	173.89	Forbidden	Forbidden	1,2	5	
	Ammunition for cannon with tear gas projectile	Class A explosive		Explosive A	None	173.54	Forbidden	Forbidden	6	5	
	Ammunition for cannon with tear gas projectile	Class B explosive		Explosive B	None	173.89	Forbidden	Forbidden	1,2	5	
	Ammunition for small-arms with explosive projectile	Class A explosive		Explosive A	None	173.58	Forbidden	Forbidden	6	5	
	Ammunition for small-arms with incendiary projectile	Class A explosive		Explosive A	None	173.58	Forbidden	Forbidden	6	5	
	<i>Ammunition, non-explosive. See 173.55</i>										
	<i>Ammunition, rocket. See Rocket ammunition with...</i>										
	<i>Ammunition, small-arms. See Small-arms ammunition</i>										
E	Amyl acetate (RQ-1000/454)	Flammable liquid	UN1104	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1,2	
	Amyl acid phosphate	Corrosive material	UN2819	Corrosive	173.244	173.245	1 quart	10 gallons	1,2	1,2	
	Amylamine	Flammable liquid	UN1106	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	Amyl chloride	Flammable liquid	UN1107	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	Amylene, normal	Flammable liquid	UN1108	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,3	1,3	
	Amyl formate	Flammable liquid	UN1109	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	Amyl mercaptan	Flammable liquid	UN1111	Flammable liquid	None	173.141	Forbidden	10 gallons	1,2	1	
	Amyl nitrite	Flammable liquid	UN1113	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,3	4	
	tert-Amyl peroxy-2-ethylhexanoate, technically pure. See Organic peroxide, liquid or solution, n.o.s.		UN2898								
	tert-Amyl peroxyneodecanoate, not more than 75% with phlegmatizer. See Organic peroxide, liquid or solution, n.o.s.		UN2891								
	Amyl trichlorosilane	Corrosive material	UN1728	Corrosive	None	173.280	Forbidden	10 gallons	1	5	13

ILLINOIS HAZARDOUS MATERIALS TRANSPORTATION REGULATIONS

§172.101 HAZARDOUS MATERIALS TABLE

(1) +/ E/ A/ W/	(2) Hazardous materials descriptions and proper shipping names	(3) Hazard class	(3A) ID Number	(4) Label(s) required (if not excepted)	(5) Packaging		(6) Maximum net quantity in one package		(7) Water Shipments		
					(a)	(b)	(a)	(b)	(a)	(b)	(c)
					Excep- tions	Specific require- ments	Passenger carrying aircraft or railcar	Cargo only aircraft	Cargo vessel	Pas- senger vessel	Other require- ments See Sec. 172.101(i)
E	Anhydrous ammonia. <i>See</i> Ammonia, anhydrous										
	Anhydrous hydrazine. <i>See</i> Hydrazine, anhydrous										
E	Anhydrous hydrofluoric acid. <i>See</i> Hydrogen fluoride										
	Aniline oil drum, empty. <i>See</i> 173.347(d)	Poison B							1,2	1	26
+E	Aniline oil, liquid (RQ-1000/ 454)	Poison B	UN1547	Poison	None	173.347	Forbidden	55 gallons	1,2	1,2	16
	Anisoyl chloride	Corrosive material	UN1729	Corrosive	173.244	173.279	1 quart	1 quart	1	1	13
	Antifreeze compound, liquid	Flammable liquid	NA1142	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	Antifreeze compound, liquid	Combust- ible liquid	NA1142	None	173.118	None	No limit	No limit	1,2	1,2	
	Antifreeze preparation, liquid	Flammable liquid	NA1142	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	Antifreeze preparation, liquid	Combust- ible liquid	NA1142	None	173.118	None	No limit	No limit	1,2	1,2	
E	Antimonous chloride. <i>See</i> Antimony trichloride										
A	Antimony lactate, solid	ORM-A	UN1550	None	173.505	173.510	No limit	No limit			
E	Antimony pentachloride (RQ-1000/454)	Corrosive material	UN1730	Corrosive	None	173.247	1 quart	1 quart	1	1	5
E	Antimony pentachloride solution (RQ-1000/454)	Corrosive material	UN1731	Corrosive	173.244	173.245	1 quart	5 pints	1	1	5
	Antimony pentafluoride	Corrosive material	UN1732	Corrosive	None	173.246	Forbidden	25 pounds	1	5	13
EA	Antimony potassium tartrate, solid (RQ-1000/454)	ORM-A	UN1551	None	173.505	173.510	No limit	No limit	1,2	1,2	
	Antimony sulfide and a chlorate mixtures of	Forbidden									
A	Antimony sulfide, solid	ORM-A	NA1325	None	173.505	173.510	No limit	No limit			
E	Antimony tribromide, solid (RQ-1000/454)	Corrosive material	NA1549	Corrosive	173.244	173.245b	25 pounds	100 pounds	1,2	1,2	13
E	Antimony tribromide solution (RQ-1000/454)	Corrosive material	NA1549	Corrosive	173.244	173.245	1 quart	5 pints	1	1	13
E	Antimony trichloride, solid (RQ-1000/454)	Corrosive material	UN1733	Corrosive	173.244	173.245b	25 pounds	100 pounds	1,2	1,2	13
E	Antimony trichloride solution (RQ-1000/454)	Corrosive material	UN1733	Corrosive	173.244	173.245	1 quart	5 pints	1	1	13
E	Antimony trifluoride, solid (RQ-1000/454)	Corrosive material	NA1549	Corrosive	173.244	173.245b	25 pounds	100 pounds	1,2	1,2	13
E	Antimony trifluoride solution (RQ-1000/454)	Corrosive material	NA1549	Corrosive	173.244	173.245	1 quart	5 pints	1	1	13
E	Antimony trioxide (RQ-5000/ 2270)	ORM-E	NA9201	None	None	173.510	No limit	No limit	1,2	1,2	
E	Aqua ammonia solution (contain- ing 14% or less ammonia). <i>See</i> Ammonium hydroxide										

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§172.101 HAZARDOUS MATERIALS TABLE

(1) +/ E/ A/ W/	(2) Hazardous materials descriptions and proper shipping names	(3) Hazard class	(3A) ID Number	(4) Label(s) required (if not excepted)	(5) Packaging		(6) Maximum net quantity in one package		(7) Water Shipments		
					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
	Argon	Non- flammable gas	UN1006	Non- flammable gas	173.306	173.302 173.314	150 pounds	300 pounds	1,2	1,3	
	Argon, liquid pressurized	Non- flammable gas	UN1951	Non- flammable gas	None	173.304	Forbidden	300 pounds	1,3	1,3	
	Arsenic acid, solid	Poison B	UN1554	Poison	173.364	173.366	50 pounds	200 pounds	1,2	1,2	
	Arsenic acid solution	Poison B	UN1553	Poison	173.345	173.348	1 quart	55 gallons	1,2	1,2	
	Arsenical compound, liquid, n.o.s., or Arsenical mixture, liquid, n.o.s.	Poison B	UN1556	Poison	173.345	173.346	1 quart	55 gallons	1,2	1,2	
	Arsenical compound, solid, n.o.s., or Arsenical mixture, solid, n.o.s.	Poison B	UN1557	Poison	173.364	173.367	50 pounds	200 pounds	1,2	1,2	13
	Arsenical dip, liquid (<i>sheep dip</i>)	Poison B	NA1557	Poison	173.345	173.346	1 quart	55 gallons	1,2	1,2	
	Arsenical dust	Poison B	UN1562	Poison	173.364	173.368	50 pounds	200 pounds	1,2	1,2	
	Arsenical pesticide, liquid, n.o.s. (<i>compounds and prepara- tions</i>).	Flammable liquid	UN2760	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	Arsenical pesticide, liquid, n.o.s. (<i>compounds and prepara- tions</i>).	Poison B	UN2759	Poison	173.345	173.346	1 quart	55 gallons	1,2	1,2	
	Arsenical pesticide, solid, n.o.s. (<i>compounds and prepara- tions</i>).	Poison B	UN2759	Poison	173.364	173.367	50 pounds	200 pounds	1,2	1,2	
	Arsenic bromide, solid	Poison B	UN1555	Poison	173.364	173.365	50 pounds	200 pounds	1,2	1,2	
E	Arsenic chloride, liquid. <i>See</i> Arsenic trichloride.										
E	Arsenic disulfide. <i>See</i> Arsenic sulfide, solid										
	Arsenic iodide, solid	Poison B	NA1557	Poison	173.364	173.365	50 pounds	200 pounds	1,2	1,2	
E	Arsenic pentoxide, solid (RQ-5000/2270)	Poison B	UN1559	Poison	173.364	173.365	50 pounds	200 pounds	1,2	1,2	
	Arsenic, solid	Poison B	UN1558	Poison	173.364	173.366	50 pounds	200 pounds	1,2	1,2	
	<i>Arsenic sulfide and a chlorate, mixtures of</i>	Forbidden									
E	Arsenic sulfide, solid (RQ-5000/2270)	Poison B	NA1557	Poison	173.364	173.365	50 pounds	200 pounds	1,2	1,2	13
E	Arsenic trichloride, liquid (RQ-5000/2270)	Poison B	UN1560	Poison	173.345	173.346	1 quart	55 gallons	1,2	1,2	
E	Arsenic trioxide, solid (RQ-5000/2270)	Poison B	UN1561	Poison	173.364	173.366 173.368	50 pounds	200 pounds	1,2	1,2	
E	Arsenic trisulfide (RQ-5000/ 2270)	Poison B	NA1557	Poison	173.364	173.365	50 pounds	200 pounds	1,2	1,2	
E	Arsenic, white, solid. <i>See</i> Arsenic trioxide, solid										
E	Arsenious acid, solid. <i>See</i> Arsenic trioxide, solid										
	Arsenious and mercuric iodide solution	Poison B	NA2810	Poison	173.345	173.346	1 quart	55 gallons	1,2	1,2	72

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§172.101 HAZARDOUS MATERIALS TABLE

(1) +/ E/ A/ W/	(2) Hazardous materials descriptions and proper shipping names	(3) Hazard class	(3A) ID Number	(4) Label(s) required (if not excepted)	(5) Packaging		(6) Maximum net quantity in one package		(7) Water Shipments		
					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
	Arsine	Poison A	UN2188	Poison gas and Flammable gas	None	173.328	Forbidden	Forbidden	1	5	
	Asbestos	ORM-C		None	173.1090	173.1090	No limit	No limit	1.2	1,2	27
	Ascaridole (organic peroxide)	Forbidden									
W	Asphalt, at or above its flashpoint	ORM-C	NA1999	None	None	None	Forbidden	Forbidden	1	5	28
	Asphalt, cut back	Flammable liquid	NA1999	Flammable liquid	173.118	173.131	1 quart	10 gallons	1.2	1	
	Asphalt, cut back	Combust- ible liquid	NA1999	None	173.118a	None	No limit	No limit	1,2	1,2	
	Automobile motorcycle, tractor, or other self-propelled vehicle. See Motor Vehicle										
	Automobile, motorcycle, tractor, or other self-propelled vehicle, engine, or other mechanical appa- ratus, with charged electric storage battery, wet. See Motor vehicle.										
	Asaurolic acid (salt of), (dry)	Forbidden									
	3-Azido - 1,2 - Propylene glycol dinitrate	Forbidden									
	5-Azido-1-hydroxy tetrazole	Forbidden									
	Azidodithiocarbonic acid	Forbidden									
	Azidoethyl nitrate	Forbidden									
	Azido guanidine picrate (dry)	Forbidden									
	Azido hydroxy tetrazole (mer- cury and silver salts)	Forbidden									
E	Azinphos methyl (RQ-1/0.454)	Poison B	NA2783	Poison	173.364	173.365	50 pounds	200 pounds	1,2	4	
E	Azinphos methyl mixture, liquid (RQ-1/0.454)	Poison B	NA2783	Poison	173.345	173.346	1/2 pint	1 quart	1,2	5	
	1 - Aziridinyl phosphine oxide (tris). See Tris -(1-aziridinyl) phosphine oxide										
	Azotetrazole (dry)	Forbidden									

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§172.101 HAZARDOUS MATERIALS TABLE

(1) +/ E/ A/ W/	(2) Hazardous materials descriptions and proper shipping names	(3) Hazard class	(3A) ID Number	(4) Label(s) required (if not excepted)	(5) Packaging		(6) Maximum net quantity in one package		(7) Water Shipments		
					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
	<i>Bags burlap, used, must be classified for the hazardous material previously contained in bag. See 173.28, 173.29.</i>										
	Bags, sodium nitrate, empty and unwashed	Flammable solid	UN1359	Flammable solid	None	173.155	Forbidden	25 pounds	1,2	1,2	29
	Barium azide, wet, 50% or more water	Flammable solid	UN1571	Flammable solid	None	173.239	Forbidden	1 pound	1,2	1,2	30
	Barium chlorate	Oxidizer	UN1445	Oxidizer	173.153	173.163	25 pounds	100 pounds	1,2	1,2	31
	Barium chlorate, wet	Oxidizer	NA1445	Oxidizer	173.153	173.163	25 pounds	200 pounds	1,2	1,2	31
E	Barium cyanide, solid (RQ-10/4.54)	Poison B	UN1565	Poison	173.370	173.370	25 pounds	200 pounds	1,2	1,2	32
	Barium nitrate	Oxidizer	UN1446	Oxidizer	173.153	173.182	25 pounds	100 pounds	1,2	1,2	
A	Barium oxide	ORM-B	UN1884	None	173.505	173.800	25 pounds	100 pounds			
	Barium perchlorate	Oxidizer	UN1447	Oxidizer	173.153	173.154	25 pounds	100 pounds	1,2	1,2	21
	Barium permanganate	Oxidizer	UN1448	Oxidizer	173.153	173.154	25 pounds	100 pounds	1,2	1,2	33
	Barium peroxide	Oxidizer	UN1449	Oxidizer	173.153	173.156	25 pounds	100 pounds	1,2	1,2	13
	Barrel, empty. See Drum, empty										
	Battery charger with electro- lyte (acid) or alkaline battery fluid	Corrosive material	NA2794	Corrosive	None	173.259	Forbidden	5 pints	1,2	1,2	
	<i>Battery, dry. Not subject to Parts 170-179 of this subchapter.</i>										
	Battery, electric storage, wet	Corrosive material	NA2794	Corrosive	173.260	173.260	Forbidden	No limit	1,2	1,2	
	Battery, electric storage, wet, with automobile, auto parts, engine (or other specifically named mechanical apparatus)	Corrosive material	NA2794	Corrosive	173.250	173.260	No limit	No limit	1,2	1,2	13
	Battery, electric storage, wet with containers of electrolyte (acid) or alkaline battery fluid	Corrosive material	NA2794	Corrosive	None	173.258	Forbidden	2 gallons	1,2	1,2	
	<i>Battery fluid. See Electrolyte (acid) or Alkaline battery fluid</i>										
	<i>Battery, lithium. See 173.280(f)</i>										
W	Battery parts (plates, grids, etc. unwashed, exhausted)	ORM-C		None	173.505	173.915			1,2	4	
	Benzaldehyde	Combust- ible liquid	NA1989	None	173.118a	None	No limit	No limit	1,2	1,2	
E	Benzene (benzol) (RQ-1000/454)	Flammable liquid	UN1114	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	Benzene diazonium chloride (dry)	Forbidden									
	Benzene diazonium nitrate (dry)	Forbidden									
	Benzene phosphorus dichloride	Corrosive material	UN2798	Corrosive	None	173.250a	Forbidden	5 pints	1	5	

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					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
	Benzene phosphorus thiodi- chloride	Corrosive material	UN2798	Corrosive	None	173.250a	Forbidden	5 pints	1	5	
	<i>Benzene triosonide</i>	Forbidden									
	Benzidine	Poison B	UN1885	Poison	173.364	173.365	50 pounds	200 pounds	1,2	1	
	Benzine	Flammable liquid	UN1115	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
E	Benzoic acid (RQ-5000/2270)	ORM-E	NA9094	None	None	173.510	No limit	No limit	1,2	1,2	
	Benzoic derivative pesticide, liquid, n.o.s. (compounds and preparations)	Flammable liquid	UN2770	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	Benzoic derivative pesticide, liquid, n.o.s. (compounds and preparations)	Poison B	UN2769	Poison	173.345	173.346	1 quart	55 gallons	1,2	1,2	
	Benzoic derivative pesticide, solid, n.o.s. (compounds and preparations)	Poison B	UN2769	Poison	173.364	173.365	50 pounds	200 pounds	1,2	1,2	
E	Benzonitrile (RQ-1000/454)	Combust- ible liquid	UN2224	None	173.118b	None	No limit	No limit	1,2	1,2	
	<i>Benzotriazoles (dry)</i>	Forbidden									
	<i>Benzoyl azide</i>	Forbidden									
E	Benzoyl chloride (RQ-1000/ 454)	Corrosive material	UN1736	Corrosive	173.244	173.247	1 quart	1 quart	1	1	5
	Benzoyl peroxide	Organic peroxide	NA2085	Organic peroxide	None	173.157 173.158	Forbidden	25 pounds	1,2	1	
	Benzoyl peroxide, more than 77% but less than 95% with water. See Benzoyl peroxide		UN2088								
	Benzoyl peroxide, not less than 30% but not more than 52% with inert solid. See Organic peroxide, solid, n.o.s.		UN2089								
	Benzoyl peroxide, not more than 72% as a paste. See Organic peroxide, solid, n.o.s.		UN2087								
	Benzoyl peroxide, not more than 77% with water. See Benzoyl peroxide		UN2090								
	Benzoyl peroxide, technically pure or Benzoyl peroxide, more than 52% with inert solid. See Benzoyl peroxide		UN2085								
	Benzyl bromide (bromotoluene, <i>alpha</i>)	Corrosive material	UN1737	Corrosive	None	173.281	Forbidden	5 pints	1	5	13
E	Benzyl chloride (RQ-100/45.4)	Corrosive material	UN1738	Corrosive	173.244	173.295	Forbidden	1 quart	1	4	13
	Benzyl chloroformate (benzyl chlorocarbonate)	Corrosive material	UN1739	Corrosive	None	173.288	Forbidden	5 pints	1	5	13
E	Beryllium chloride (RQ-5000/ 2270)	Poison B	NA1566	Poison	173.364	173.365	50 pounds	200 pounds	1,2	1,2	
	Beryllium compound, n.o.s.	Poison B	UN1566	Poison	173.364	173.365	50 pounds	200 pounds	1,2	1,2	
E	Beryllium fluoride (RQ-5000/ 2270)	Poison B	NA1566	Poison	173.364	173.365	50 pounds	200 pounds	1,2	1,2	

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					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
E	Beryllium nitrate (RQ-5000/ 2270)	Oxidizer	UN2464	Oxidizer	173.153	173.182	25 pounds	100 pounds	1,2	1,2	
	<i>Biphenyl trioxonide</i>	Forbidden									
	Bipyridilium pesticide, liquid, n.o.s. (compounds and prepara- tions)	Flammable liquid	UN2782	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	Bipyridilium pesticide, liquid, n.o.s. (compounds and prepara- tions)	Poison B	UN2781	Poison	173.345	173.346	1 quart	55 gallons	1,2	1,2	
	Bipyridilium pesticide, solid, n.o.s. (compounds and prepara- tions)	Poison B	UN2781	Poison	173.364	173.365	50 pounds	200 pounds	1,2	1,2	
	Black powder	Class A explosive		Explosive A	None	173.60	Forbidden	Forbidden	6	5	
	Black powder igniter with empty cartridge bag	Class C explosive		Explosive C	None	173.106	50 pounds	150 pounds	1,3	1,3	
	Blasting agent, n.o.s.	Blasting agent		Blasting agent	None	173.114a	Forbidden	100 pounds	1,2	1,2	
	<i>Blasting caps. See Detonators Class A or Class C explosives</i>										
	<i>Blasting caps, electric. See Detonators, Class A or Class C explosives</i>										
	<i>Blasting caps, percussion acti- vated. See Detonators, Class A or Class C explosives</i>										
	<i>Blasting caps with detonating cord. See Detonators, Class A or Class C explosives and Deto- nating primers, Class A or Class C explosives.</i>										
	<i>Blasting caps with metal clad mild detonating fuse. See Deto- nators, Class A or Class C explosives</i>										
	<i>Blasting caps with safety fuse. See Detonators, Class A or Class C explosives</i>										
W	<i>Blasting caps with shock tubes. See Detonators, Class A or Class C explosives</i>										
	<i>Blasting gelatin. See High explosive</i>										
	<i>Blasting powder. See Black powder</i>										
	Bleaching powder, containing 39% or less available chlorine	ORM-C	UN2208	None	173.505	173.920			1,2	1,2	37
	Boiler compound, liquid	Corrosive material	NA1760	Corrosive	173.244	173.249	1 quart	10 gallons	1,2	1,2	
	<i>Bomb, explosive. See Explosive bomb</i>										
	<i>Bomb, explosive with gas, smoke, or incendiary material. See Explosive bomb</i>										
	<i>Bomb, fireworks. See Fireworks, special</i>										
	<i>Bomb, gas, smoke, or incendiary, nonexplosive. See Chemical ammunition nonexplosive</i>										

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(1) +/ E/ A/ W/	(2) Hazardous materials descriptions and proper shipping names	(3) Hazard class	(3A) ID Number	(4) Label(s) required (if not excepted)	(5) Packaging		(6) Maximum net quantity in one package		(7) Water Shipments		
					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
	Bomb, incendiary, or smoke without bursting charge. See Fireworks, special										
	Bomb, practice, with electric primer or electric squib (non-explosive). See 173.55										
	Bomb, sand-loaded or empty (non-explosive). See 173.55										
A	Bone oil	ORM-A		None	173.505	173.510	No limit	No limit			
	Booster, explosive	Class A explosive		Explosive A	None	173.69	Forbidden	Forbidden	6	5	
	Bordeaux arsenite, liquid	Poison B	NA2759	Poison	173.345	173.346	1 quart	55 gallons	1,2	1,2	
	Bordeaux arsenite, solid	Poison B	NA2759	Poison	173.364	173.365	50 pounds	200 pounds	1,2	1,2	
	Boron tribromide	Corrosive material	UN2692	Corrosive	None	173.251	Forbidden	1 quart	1	5	
	Boron trichloride	Corrosive material	UN1741	Corrosive	None	173.251	Forbidden	1 quart	1,2	5	38
+	Boron trifluoride	Non-flammable gas	UN1008	Non-flammable gas and Poison	None	173.302	Forbidden	Forbidden	1	5	39
	Boron trifluoride-acetic acid complex	Corrosive material	UN1742	Corrosive	173.244	173.247	1 quart	1 gallon	1,2	1,2	
	Bottles having previously contained a hazardous material and not cleaned. See 173.29										
W	Box toe board (nitrocellulose base)	ORM-C		None	173.505	173.925			1,3	1,3	40
	Box toe gum	Combustible liquid	UN2060	None	173.118a	None	No limit	No limit	1,2	1,2	
	Box toe gum	Flammable liquid	UN2059	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	Bromine	Corrosive material	UN1744	Corrosive	None	173.252	Forbidden	1 quart	1	5	8
	Bromine azide	Forbidden									
	Bromine pentafluoride	Oxidizer	UN1745	Oxidizer	None	173.246	Forbidden	100 pounds	1	5	41
	Bromine trifluoride	Oxidizer	UN1746	Oxidizer and Poison	None	173.246	Forbidden	100 pounds	1	5	41
	4-Bromo-1,2-dinitrobenzene (unstable at 59 deg C.)	Forbidden									
	1-Bromo-2-nitrobenzene (unstable at 59 deg C.)	Forbidden									
	Bromoacetic acid, solid	Corrosive material	UN1938	Corrosive	173.244	173.245b	25 pounds	100 pounds	1,2	1,2	13
	Bromoacetic acid solution	Corrosive material	UN1938	Corrosive	173.244	173.245	1 quart	1 quart	1,2	1,2	7
	Bromoacetone, liquid	Poison A	UN1569	Poison gas	None	173.329	Forbidden	Forbidden	1	5	42
	Bromobenzene	Combustible liquid	UN2514	None	173.118a	None	No limit	No limit	1,2	1,2	

ILLINOIS HAZARDOUS MATERIALS TRANSPORTATION REGULATIONS

§172.101 HAZARDOUS MATERIALS TABLE

(1) +/ E/ A/ W/	(2) Hazardous materials descriptions and proper shipping names	(3) Hazard class	(3A) ID Number	(4) Label(s) required (if not excepted)	(5) Packaging		(6) Maximum net quantity in one package		(7) Water Shipments		
					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i).
A	Bromochloromethane	ORM-A	UN1887	None	173.505	173.605	10 gallons	55 gallons			
	<i>Bromosilane</i>	Forbidden									
	<i>Bromotoluene, alpha. See Benzyl bromide</i>										
	<i>Brucine, solid (dimethoxy strychnine)</i>	Poison B	UN1570	Poison	173.364	173.365	50 pounds	200 pounds	1,2	1,2	
W	<i>Burlap bags, cleaned (vacuum cleaned, wheel cleaned, or otherwise mechanically brushed). See Burlap cloth</i>										
W	<i>Burlap bags, new. See Burlap cloth</i>										
AW	<i>Burlap bags, used and unwashed, or not cleaned</i>	ORM-C		None	173.505	173.930	No limit	No limit	1	1	8
W	<i>Burlap cloth (hessian)</i>	ORM-C		None	173.505	173.931			1,2	1,2	43
	<i>Burnt cotton, not repicked</i>	Flammable solid	NA1325	Flammable solid	None	173.159	Forbidden	Forbidden	1	5	29
	<i>Burnt fiber</i>	Flammable solid	NA1372	Flammable solid	None	173.169	Forbidden	Forbidden	1,2	1,2	29
	<i>Burster, explosive</i>	Class A explosive		Explosive A	None	173.69	Forbidden	Forbidden	6	5	
+	<i>Butadiene, inhibited</i>	Flammable gas	UN1010	Flammable gas	173.306	173.304 173.314 173.315	Forbidden	300 pounds	1,2	1	44
	<i>Butane or Liquefied petroleum gas. See Liquefied petroleum gas</i>										
	<i>1,2,4-Butanetriol trinitrate</i>	Forbidden									
	<i>tert-Butoxycarbonyl azide</i>	Forbidden									
	<i>n-Butyl-4,4-di-(tert-butyl- peroxy)valerate, technically pure. See Organic peroxide, liquid or solution, n.o.s.</i>		UN2140								
	<i>n-Butyl-4,4-di-(tert-butyl- peroxy)valerate, not more than 52% with inert solid. See Organic peroxide, solid, n.o.s.</i>		UN2141								
E	<i>Butyl acetate (RQ-5000/2270)</i>	Flammable liquid	UN1123	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	<i>n-Butyl acid phosphate. See Acid butyl phosphate</i>										
	<i>Butyl alcohol</i>	Flammable liquid	NA1120	Flammable liquid	173.118	173.125	1 quart	10 gallons	1,2	1	
E	<i>Butylamine (RQ-1000/454)</i>	Flammable liquid	UN1125	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	<i>Butyl bromide, normal</i>	Flammable liquid	UN1126	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	<i>Butyl chloride</i>	Flammable liquid	UN1127	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	

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§172.101 HAZARDOUS MATERIALS TABLE

(1) +/ E/ A/ W/	(2) Hazardous materials descriptions and proper shipping names	(3) Hazard class	(3A) ID Number	(4) Label(s) required (if not excepted)	(5) Packaging		(6) Maximum net quantity in one package		(7) Water Shipments		
					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
	tert-Butyl cumyl peroxide, <i>technically pure</i> or tert-Butyl cumene peroxide, <i>technically pure</i> . See Organic peroxide, liquid or solution, n.o.s.		UN2091								
	Butyl ether	Flammable liquid	UN1149	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1,2	
	Butyl formate	Flammable liquid	UN1128	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	tert-Butyl hydroperoxide, more than 72% but not more than 90% with water. See Organic peroxide, liquid or solution, n.o.s.		UN2094								
	tert-Butyl hydroperoxide, not more than 72% with water. See Organic peroxide, liquid or solution, n.o.s.		UN2093								
	tert-Butyl hydroperoxide, not more than 80% in di-tert-butyl peroxide and solvent. See Organic peroxide, liquid or solution, n.o.s.		UN2092								
	tert-Butyl hydroperoxide, not more than 80% in di-tert-butyl peroxide or solvent. See Organic peroxide, liquid or solution, n.o.s.		UN2092								
	tert-Butyl hydroperoxide, more than 90% with water	Forbidden									
	n-Butyl isocyanate	Flammable liquid	UN2485	Flammable liquid and Poison	173.118	173.119	1 quart	10 gallons	1,2	1	
	tert-Butyl isopropyl benzene hydroperoxide	Organic peroxide	NA2091	Organic peroxide	173.153	173.224	1 quart	1 quart	1,2	4	
	Butyl mercaptan	Flammable liquid	UN2347	Flammable liquid	None	173.141	Forbidden	10 gallons	1,3	5	
	tert-Butyl peroxy-2-ethyl-hexanoate, <i>technically pure</i> . See Organic peroxide, liquid or solution, n.o.s.		UN2143								
	tert-Butyl peroxy-2-ethyl-hexanoate, not more than 30% with 2,2-Di-(tert-butylperoxy) butane, not more than 35%, with not less than 35% phlegmatizer. See Organic peroxide, liquid or solution, n.o.s.		UN2886								
	tert-Butyl peroxy-2-ethyl-hexanoate, not more than 12% with 2,2-Di-(tert-butylperoxy) butane, not more than 14% with not less than 14% phlegmatizer and 60% inert inorganic solid. See Organic peroxide, solid, n.o.s.		UN2887								
	tert-Butyl peroxy-2-ethyl-hexanoate, not more than 50% with phlegmatizer. See Organic peroxide, liquid or solution, n.o.s.		UN2888								
	tert-Butyl peroxy-3,5,5-trimethylhexanoate or tert-Butyl peroxyisononanoate, <i>technically pure</i> . See Organic peroxide, liquid or solution, n.o.s.		UN2104								

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§172.101 HAZARDOUS MATERIALS TABLE

(1) +/ E/ A/ W/	(2) Hazardous materials descriptions and proper shipping names	(3) Hazard class	(3A) ID Number	(4) Label(s) required (if not excepted)	(5) Packaging		(6) Maximum net quantity in one package		(7) Water Shipments		
					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
	3-tert-Butyl peroxy-3-phenyl-phthalide, <i>technically pure</i> . See Organic peroxide, solid, n.o.s.		UN2596								
	tert-Butyl peroxyacetate, <i>not more than 76% in solution</i> . See Organic peroxide, liquid or solution, n.o.s.		UN2095								
	tert-Butyl peroxyacetate, <i>not more than 52% in solution</i> . See Organic peroxide, liquid or solution, n.o.s.		UN2096								
	tert-Butyl peroxyacetate, <i>more than 76% in solution</i>	Forbidden									
	tert-Butyl peroxybenzoate, <i>not more than 75% in solution</i> . See Organic peroxide, liquid or solution, n.o.s.		UN2098								
	tert-Butyl peroxybenzoate, <i>not more than 50% with inert inorganic solid</i> . See Organic peroxide, solid, n.o.s.		UN2890								
	tert-Butyl peroxybenzoate, <i>technically pure or tert-Butyl peroxybenzoate, more than 75% in solution</i> . See Organic peroxide, liquid or solution, n.o.s.		UN2097								
	tert-Butyl peroxycrotonate, <i>not more than 76% in solution</i> . See Organic peroxide, liquid or solution, n.o.s.		UN2183								
	n-Butyl peroxydicarbonate, <i>not more than 52% in solution</i> . See Organic peroxide, liquid or solution, n.o.s.		UN2169								
	n-Butyl peroxydicarbonate, <i>not more than 27% in solution</i> . See Organic peroxide, liquid or solution, n.o.s.		UN2170								
	n-Butyl peroxydicarbonate, <i>more than 52% in solution</i>	Forbidden									
	tert-Butyl peroxydiethylacetate, <i>33% with tert-Butyl peroxybenzoate, 33%, and solvent</i> . See Organic peroxide, liquid or solution, n.o.s.		UN2551								
	tert-Butyl peroxydiethylacetate, <i>technically pure</i> . See Organic peroxide, liquid or solution, n.o.s.		UN2144								
	tert-Butyl peroxyisobutyrate, <i>more than 52% but not more than 77% in solution</i> . See Organic peroxide, liquid or solution, n.o.s.		UN2142								
	tert-Butyl peroxyisobutyrate, <i>not more than 52% in solution</i> . See Organic peroxide, liquid or solution, n.o.s.		UN2562								
	tert-Butyl peroxyisobutyrate, <i>more than 77% in solution</i>	Forbidden									
	tert-Butyl peroxyisopropyl carbonate, <i>technically pure</i> . See Organic peroxide, liquid or solution, n.o.s.		UN2103								

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§172.101 HAZARDOUS MATERIALS TABLE

(1) E/ A/ W/	(2) Hazardous materials descriptions and proper shipping names	(3) Hazard class	(3A) ID Number	(4) Label(s) required (if not excepted)	(5) Packaging		(6) Maximum net quantity in one package		(7) Water Shipments		
					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
	tert-Butyl peroxyneodecanoate, <i>not more than 55% in solution. See Organic peroxide, liquid or solution, n.o.s.</i>		UN2100								
	tert-Butyl peroxyneodecanoate, <i>not more than 55% as a paste. See Organic peroxide, solid, n.o.s.</i>		UN2101								
	tert-Butyl peroxyneodecanoate, <i>technically pure. See Organic peroxide, solid, n.o.s.</i>		UN2099								
	tert-Butyl peroxyneodecanoate, <i>not more than 77% in solution. See Organic peroxide, liquid or solution, n.o.s.</i>		UN2177								
	tert-Butyl peroxyneodecanoate, <i>technically pure. See Organic peroxide, liquid or solution, n.o.s.</i>		UN2594								
	tert-Butyl peroxyphthalate, <i>technically pure. See Organic peroxide, solid, n.o.s.</i>		UN2105								
	tert-Butyl peroxyphthalate, <i>not more than 77% in solution. See Organic peroxide, liquid or solution, n.o.s.</i>		UN2110								
	Butyl phosphoric acid. <i>See Acid butyl phosphate</i>										
E	n-Butyl phthalate (RQ-100/45.4)	ORM-E	NA9095	None	None	173.510	No limit	No limit	1,2	1,2	
	Butyl trichlorosilane	Corrosive material	UN1747	Corrosive	None	173.280	Forbidden	10 gallons	1	1	13
	Butyraldehyde	Flammable liquid	UN1129	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
E	Butyric acid (RQ-5000/2270)	Corrosive material	UN2820	Corrosive	173.244	173.245	1 quart	10 gallons	1,2	1,2	

ILLINOIS HAZARDOUS MATERIALS TRANSPORTATION REGULATIONS

§172.101 HAZARDOUS MATERIALS TABLE

(1) +/ E/ A/ W/	(2) Hazardous materials descriptions and proper shipping names	(3) Hazard class	(3A) ID Number	(4) Label(s) required (if not excepted)	(5) Packaging		(6) Maximum net quantity in one package		(7) Water Shipments		
					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
	<i>Cabazitide</i>	Forbidden									
E	Cadmium acetate (RQ-100/45.4)	ORM-E	NA2570	None	None	173.510	No limit	No limit	1,2	1,2	
E	Cadmium bromide (RQ-100/45.4)	ORM-E	NA2570	None	None	173.510	No limit	No limit	1,2	1,2	
E	Cadmium chloride (RQ-100/45.4)	ORM-E	NA2570	None	None	173.510	No limit	No limit	1,2	1,2	45
E	Calcium arsenate, solid (RQ-1000/454)	Poison B	UN1573	Poison	173.364	173.367 173.368	50 pounds	200 pounds	1,2	1,2	
E	Calcium arsenite, solid (RQ-1000/454)	Poison B	NA1574	Poison	173.364	173.365	50 pounds	200 pounds	1,2	1,2	
	Calcium bisulfite solution. See Calcium hydrogen sulfite solution										
E	Calcium carbide (RQ-5000/2270)	Flammable solid	UN1402	Flammable solid and dangerous when wet	None	173.178	Forbidden	25 pounds	1,2	1,2	46
	Calcium chlorate	Oxidizer	UN1452	Oxidizer	173.153	173.163	25 pounds	100 pounds	1,2	1,2	47
	Calcium chlorite	Oxidizer	UN1453	Oxidizer	None	173.160	Forbidden	100 pounds	1,2	1,2	153
E	Calcium chromate (RQ-1000/454)	ORM-E	NA9096	None	None	173.510	No limit	No limit	1,2	1,2	
AW	Calcium cyanamide, not hydrated containing more than 0.1% calcium carbide	ORM-C	UN1403	None	None	173.945	25 pounds	200 pounds	1,2	1,2	14
E	Calcium cyanide, solid or Calcium cyanide mixture, solid (RQ-10/4.54)	Poison B	UN1575	Poison	173.370	173.370	25 pounds	200 pounds	1,2	1,2	48
E	Calcium dodecylbenzenesulfonate (RQ-1000/454)	ORM-E	NA9097	None	None	173.510	No limit	No limit	1,2	1,2	
	Calcium hydrogen sulfite solution	Corrosive material	UN2693	Corrosive	173.244	173.245	1 quart	5 gallons	1,2	1,2	
E	Calcium hypochlorite, hydrated (minimum 5.5% but not more than 10% water, and containing more than 39% available chlorine) (RQ-100/45.4)	Oxidizer	UN2880	Oxidizer	173.153	173.217	50 pounds	100 pounds	1,2	1,2	
E	Calcium hypochlorite mixture, dry. (Containing more than 39% available chlorine) (RQ-100/45.4)	Oxidizer	UN1748	Oxidizer	173.153	173.217	50 pounds	100 pounds	1,2	1,2	10
	Calcium, metal	Flammable solid	UN1401	Flammable solid and Dangerous when wet	173.153	173.154	25 pounds	100 pounds	1,2	4	49
	Calcium, metal, crystalline	Flammable solid	NA1401	Flammable solid and Dangerous when wet	None	173.231	Forbidden	25 pounds	1,2	5	49
	Calcium nitrate (See 173.182(a) Note)	Oxidizer	UN1454	Oxidizer	173.153	173.182	25 pounds	100 pounds	1,2	1,2	
AW	Calcium oxide	ORM-B	UN1910	None	173.505	173.850	25 pounds	100 pounds	1,2	1,2	50
	Calcium permanganate	Oxidizer	UN1456	Oxidizer	173.153	173.154	25 pounds	100 pounds	1,2	1,2	33
	Calcium peroxide	Oxidizer	UN1457	Oxidizer	173.153	173.156	25 pounds	100 pounds	1,2	1,2	13
	Calcium phosphide	Flammable solid	UN1360	Flammable solid and Dangerous when wet	None	173.161	Forbidden	25 pounds	1	5	49

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(1) +/ E/ A/ W/	(2) Hazardous materials descriptions and proper shipping names	(3) Hazard class	(3A) ID Number	(4) Label(s) required (if not excepted)	(5) Packaging		(6) Maximum net quantity in one package		(7) Water Shipments		
					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
AW	Calcium resinate	Flammable solid	UN1313	Flammable solid	None	173.166	Forbidden	125 pounds	1	5	
	Calcium resinate, fused	Flammable solid	UN1314	Flammable solid	None	173.166	Forbidden	125 pounds	1	5	
	Camphene	ORM-A	NA9011	None	173.505	173.610	No limit	No limit	1,3	1,3	39
	Camphor oil	Combust- ible liquid	UN1130	None	173.118a	None	No limit	No limit	1,2	1,2	
	Cannon primer	Class C explosive		None	None	173.107	50 pounds	150 pounds	1,3	5	
	Caprylyl peroxide solution	Organic peroxide	NA2129	Organic peroxide	173.153	173.221	1 quart	1 quart	1,2	4	51
	<i>Caps, blasting. See Detonators, Class A or Class C explosives</i>										
	<i>Caps, toy. See Toy caps</i>										
E	Captan (RQ-10/4.54)	ORM-E	NA9099	None	None	173.510	100 pounds	No limit	1,2	1,2	
	Carbamate pesticide, liquid, n.o.s. (compounds and prepara- tions)	Flammable liquid	UN2758	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	Carbamate pesticide, liquid, n.o.s. (compounds and prepara- tions)	Poison B	UN2757	Poison	173.345	173.346	1 quart	55 gallons	1,2	1,2	
	Carbamate pesticide, solid, n.o.s. (compounds and prepara- tions)	Poison B	UN2757	Poison	173.364	173.365	50 pounds	200 pounds	1,2	1,2	
EA	Carbaryl (RQ-100/45.4)	ORM-A	NA2757	None	173.505	173.510	No limit	No limit	1,2	1,2	
E	Carbofuran (RQ-10/4.54)	Poison B	NA2757	Poison	173.364	173.365	50 pounds	200 pounds	1,2	1,2	
E	Carbofuran mixture, liquid (RQ-10/4.54)	Poison	NA2757	Poison	173.345	173.346	1 quart	55 gallons	1,2	1,2	
+E	Carbolic acid. See Phenol										
E	Carbolic acid, liquid (liquid tar acid containing over 50% phenol). See Phenol, liquid										
E	Carbon bisulfide, or Carbon disulfide (RQ-5000/2270)	Flammable liquid	UN1131	Flammable liquid	None	173.121	Forbidden	Forbidden	1	5	52
	Carbon dioxide, liquefied	Non- flammable gas	UN2187	Non- flammable gas	173.306	173.304 173.314 173.315	150 pounds	300 pounds	1,2	1,2	
	Carbon dioxide-nitrous oxide mixture	Non- flammable gas	UN1015	Non- flammable gas	173.306	173.304	150 pounds	300 pounds	1,2	1,2	
	Carbon dioxide-oxygen mixture	Non- flammable gas	UN1014	Non- flammable gas	173.306	173.304	150 pounds	300 pounds	1,2	1,2	
AW	Carbon dioxide, solid, or Dry ice, or Carbonice	ORM-A	UN1845	None	None	173.615	440 pounds	440 pounds	1	1	53
+	Carbon monoxide	Flammable gas	UN1016	Flammable gas	173.306	173.302	Forbidden	150 pounds	1	4	
	Carbon remover, liquid	Flammable liquid	UN1132	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
EAW	Carbon tetrachloride (RQ-5000/2270)	ORM-A	UN1846	None	173.505	173.620	1 quart	55 gallons	1,2	1,2	44
	<i>Carbonyl chloride. See Phosgene</i>										

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(1) +/ E/ A/ W/	(2) Hazardous materials descriptions and proper shipping names	(3) Hazard class	(3A) ID Number	(4) Label(s) required (if not excepted)	(5) Packaging		(6) Maximum net quantity in one package		(7) Water Shipments		
					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
	Carboys empty must be classed for the hazardous material previously contained in carboy. See 173.29										
	Cartridge bags empty, with black powder igniter	Class C explosive		Explosive C	None	173.106	50 pounds	150 pounds	1,3	1,3	
	Cartridge cases, empty primed	Class C explosive		None	None	173.107	50 pounds	150 pounds	1,3	1,3	
	Cartridge, practice ammunition	Class C explosive		Explosive C	None	173.101a	50 pounds	150 pounds	1,2	1,2	
	Case oil. See Gasoline or Naptha										
	Casinghead gasolins. See Gasoline										
W	Castor Beans	ORM-C		None	173.505	173.952			1,2	1,2	54
W	Castor pomace. See Castor beans										
E	Caustic, potash, dry, solid, flake, bead, or granular. See Potassium hydroxide, dry, etc.										
E	Caustic potash, liquid or solution. See Potassium hydroxide solution										
E	Caustic soda, dry, solid, flake, bead, or granular. See Sodium hydroxide, dry, etc.										
E	Caustic soda, liquid or solution. See Sodium hydroxide solution										
W	Cellosolve. See Ethylene glycol monoethyl ether										
W	Cellosolve acetate. See Ethylene glycol monoethyl ether acetate										
	Cement, adhesive, n.o.s. See Cement, liquid, n.o.s.										
	Cement, container, linoleum, tile, or wallboard, liquid	Flammable liquid	NA1133	Flammable liquid	173.118	173.132	1 quart	15 gallons	1,2	1	
	Cement, leather	Flammable liquid	NA1133	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	Cement liquid, n.o.s.	Combustible liquid	NA1133	None	173.118a	None	No limit	No limit	1,2	1,2	
	Cement, liquid, n.o.s.	Flammable liquid	NA1133	Flammable liquid	173.118	173.132	1 quart	10 gallons	1,2	1	
	Cement, pyroxylin	Flammable liquid	NA1133	Flammable liquid	173.118	173.132	1 quart	15 gallons	1,2	1	
	Cement, roofing, liquid	Flammable liquid	NA1133	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	Cement, rubber	Flammable liquid	NA1133	Flammable liquid	173.118	173.132	1 quart	15 gallons	1,2	1	
	Cesium metal	Flammable solid	UN1407	Flammable solid and dangerous when wet	None	173.206	Forbidden	25 pounds	1,2	5	14
	Charcoal, activated	Flammable solid	UN1362	Flammable solid	173.162	173.162	25 pounds	200 pounds	1,3	1,3	
	Charcoal briquettes or briquets	Flammable solid	NA1361	Flammable solid	173.162	173.162	50 pounds	50 pounds	1,2	1,2	

ILLINOIS HAZARDOUS MATERIALS TRANSPORTATION REGULATIONS

§172.101 HAZARDOUS MATERIALS TABLE

(1) +/ E/ A/ W/	(2) Hazardous materials descriptions and proper shipping names	(3) Hazard class	(3A) ID Number	(4) Label(s) required (if not excepted)	(5) Packaging		(6) Maximum net quantity in one package		(7) Water Shipments		
					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
	Charcoal screenings made from 'pinon' wood	Flammable solid	NA1361	Flammable solid	173.162	173.162	25 pounds	200 pounds	1,2	1	
	<i>Charcoal screenings, wet</i>	Forbidden									
	Charcoal, shell	Flammable solid	NA1361	Flammable solid	173.162	173.162	25 pounds	200 pounds	1,2	1,2	
	<i>Charcoal, wet</i>	Forbidden									
	Charcoal, wood, ground, crushed, granulated, or pulverized	Flammable solid	NA1361	Flammable solid	173.162	173.162	25 pounds	200 pounds	1,2	1,2	
	Charcoal wood, lump	Flammable solid	NA1361	Flammable solid	173.162	173.162	50 pounds	50 pounds	1,2	1,2	
	Charcoal wood screenings, other than 'pinon' wood screenings	Flammable solid	NA1361	Flammable solid	None	173.162	Forbidden	Forbidden	1	1	
	Charged oil well jet perforating gun (total explosive contents in guns 20 pounds or more per motor vehicle)	Class A explosive		Explosive A	None	173.53 173.80	Forbidden	Forbidden			55
	Charged oil well jet perforating gun (total explosive contents in guns not exceeding 20 pounds per motor vehicle or special offshore down hole tool pallet)	Class C explosive		Explosive C	None	173.53 173.110	Forbidden	Forbidden	1,2	5	55
	<i>Chemical ammunition, explosive. See Ammunition, chemical, explo- sive, with ...</i>										
	Chemical ammunition, non- explosive (containing a Poison B material)	Poison B	UN2016	Poison	173.345	173.350	Forbidden	55 gallons			56
	Chemical ammunition, non- explosive (containing an irri- tating material)	Irritating material	UN2017	Irritant	None	173.383	Forbidden	20 pounds			57
	Chemical ammunition non- explosive (containing a Poison A material)	Poison A	UN2016	Poison Gas	None	173.330	Forbidden	Forbidden			58
	Chemical kit	Corrosive material	NA1760	Corrosive	173.286		1 quart	1 quart	1,3	1,3	
	Chlorate and borate mixture (containing more than 28% chlorate)	Oxidizer	UN1458	Oxidizer	173.153	173.229	25 pounds	100 pounds	1,2	4	146
	Chlorate and magnesium chloride mixture (containing more than 28% chlorate)	Oxidizer	UN1459	Oxidizer	173.153	173.229	25 pounds	100 pounds	1,2	4	146
	<i>Chlorate explosive, dry. See High explosive</i>										
	Chlorate, n.o.s.	Oxidizer	UN1461	Oxidizer	173.153	173.163	25 pounds	100 pounds	1,2	4	146
	Chlorate, n.o.s., wet	Oxidizer	NA1461	Oxidizer	173.153	173.163	25 pounds	200 pounds	1,2	4	146
	Chlorate of potash. <i>See</i> Potas- sium chlorate										
	Chlorate of soda. <i>See</i> Sodium chlorate										
	Chlorate powder. <i>See</i> High explosive										
E	Chlordane liquid (RQ-I/O-454)	Flammable liquid	NA2762	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
W	Chlordane, liquid (RQ-I/O-454)	Combust- ible liquid	NA2762	None	173.118a	None	No limit	No limit	1,2	1,2	

ILLINOIS HAZARDOUS MATERIALS TRANSPORTATION REGULATIONS

§172.101 HAZARDOUS MATERIALS TABLE

(1) +/ E/ A/ W/ W	(2) Hazardous materials descriptions and proper shipping names	(3) Hazard class	(3A) ID Number	(4) Label(s) required (if not excepted)	(5) Packaging		(6) Maximum net quantity in one package		(7) Water Shipments		
					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
	Chloric acid	Oxidizer	NA2626	Oxidizer and Poison	None	173.237	Forbidden	Forbidden			55
	Chloride of phosphorus. <i>See</i> Phosphorus trichloride										
	Chloride of sulfur. <i>See</i> Sulfur chloride										
W	Chlorinated lime (<i>chloride of lime.</i>) <i>See</i> Bleaching powder										
+E	Chlorine (RQ-10/4.54)	Non- flammable gas	UN1017	Non- flammable gas and Poison	None	173.304 173.314 173.315	Forbidden	Forbidden	1,2	5	59
	<i>Chlorine azide</i>	Forbidden									
	Chlorine dioxide hydrate, frozen	Oxidizer	NA9191	Oxidizer and Poison	None	173.237	Forbidden	Forbidden			55
	<i>Chlorine dioxide (not hydrate)</i>	Forbidden									
	Chlorine trifluoride	Oxidizer	UN1749	Oxidizer and Poison	None	173.246	Forbidden	100 pounds	1,3	5	59
	Chloroacetic acid, liquid or solution	Corrosive material	UN1750	Corrosive	173.244	173.294	1 quart	1 quart	1,2	1,2	7
	Chloroacetic acid, solid	Corrosive material	UN1751	Corrosive	173.244	173.245b	25 pounds	100 pounds	1,2	1,2	13
	Chloroacetophenone, gas, liquid, or solid (CN)	Irritating material	UN1697	Irritant	None	173.382	Forbidden	75 pounds	1	5	
	Chloroacetyl chloride	Corrosive material	UN1752	Corrosive	None	173.253	Forbidden	1 quart	1	5	13
E	Chlorobenzene (RQ-100/45.4)	Flammable liquid	UN1134	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1,2	
E	Chlorobenzol. <i>See</i> Chlorobenzene										
	p-Chlorobenzoyl peroxide	Organic peroxide	UN2113	Organic peroxide	None	173.157 173.158	Forbidden	25 pounds	1	1	
	p-Chlorobenzoyl peroxide, <i>not more than 75% with water.</i> <i>See</i> p-Chlorobenzoyl peroxide		UN2113								
	p-Chlorobenzoyl peroxide, <i>not more than 52% as a paste.</i> <i>See</i> Organic peroxide, solid, n.o.s.		UN2114								
	p-Chlorobenzoyl peroxide, <i>not more than 52% in solution.</i> <i>See</i> Organic peroxide, liquid or solution, n.o.s.		UN2115								
	<i>Chlorodinitrobenzene. See</i> Dinitrochlorobenzene										
EAW	Chloroform (RQ-5000/2270)	ORM-A	UN1888	None	173.505	173.630	10 gallons	55 gallons	1,2	1,2	39
+	4-Chloro-o-toluidine hydro- chloride	Poison B	UN1579	Poison	None	173.362	Forbidden	1 quart	1,2	1,2	
	3-Chloroperoxybenzoic acid, <i>not more than 86% with 3-chloro- benzoic acid See</i> Organic peroxide, solid, n.o.s.										
	Chlorophenyltrichlorosilane	Corrosive material	UN1753	Corrosive	None	173.280	Forbidden	10 gallons	1	1	13
+	Chloropicrin, absorbed	Poison B	NA1583	Poison	None	173.357	Forbidden	Forbidden	1	5	8

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§172.101 HAZARDOUS MATERIALS TABLE

(1) +/ E/ A/ W/	(2) Hazardous materials descriptions and proper shipping names	(3) Hazard class	(3A) ID Number	(4) Label(s) required (if not excepted)	(5) Packaging		(6) Maximum net quantity in one package		(7) Water Shipments		
					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
+	Chloropicrin and methyl chloride mixture	Poison A	UN1582	Poison gas and Flam- mable gas	None	173.329	Forbidden	Forbidden	1	5	72
+	Chloropicrin and nonflammable, nonliquefied compressed gas mixture	Poison A	NA1955	Poison gas and Flam- mable gas	None	173.329	Forbidden	Forbidden	1	5	8
+	Chloropicrin, liquid	Poison B	UN1580	Poison	None	173.357	Forbidden	Forbidden	1	5	8
+	Chloropicrin mixture (containing no compressed gas or Poison A liquid)	Poison B	UN1583	Poison	None	173.357	Forbidden	Forbidden	1	5	8
A	Chloroplatinic acid, solid	ORM-B	UN2507	None	173.505	173.800	25 pounds	100 pounds			
	Chloroprene, inhibited	Flammable liquid	UN1991	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	Chloroprene, uninhibited	Forbidden									
	2-Chloropropene	Flammable liquid	UN2456	Flammable liquid	None	173.119	Forbidden	10 gallons	1,2	5	
E	Chlorosulfonic acid (RQ-1000/ 454)	Corrosive	UN1754	Corrosive	173.244	173.254	1 quart	1 quart	1	1	5
E	Chlorosulfonic acid-sulfur trioxide mixture (RQ-1000/454)	Corrosive material	UN1754	Corrosive	173.144	173.254	1 quart	1 quart	1	1	5
EA	Chlorpyrifos (RQ-1/0.454)	ORM-A	NA2783	None	173.505	173.510	100 pounds	No limit	1,2	1,2	
E	Chromic acetate (RQ-1000/454)	ORM-E	NA9101	None	None	173.510	No limit	No limit	1,2	1,2	
E	Chromic acid mixture, dry (RQ-1000/454)	Oxidizer	NA1463	Oxidizer	173.153	173.164	25 pounds	100 pounds	1,2	1,2	60
E	Chromic acid, solid (RQ-1000/454)	Oxidizer	UN1463	Oxidizer	173.153	173.164	25 pounds	100 pounds	1,2	1,2	61
E	Chromic acid solution (RQ-1000/454)	Corrosive material	UN1755	Corrosive	173.244	173.287	1 quart	1 gallon	1	1	
E	Chromic anhydride. See Chromic acid, solid										
	Chromic fluoride, solid	Corrosive material	UN1756	Corrosive	173.244	173.245b	25 pounds	100 pounds	1,2	1,2	
	Chromic fluoride solution	Corrosive material	UN1757	Corrosive	173.244	173.245	1 quart	1 gallon	1,2	1,2	
E	Chromic sulfate (RQ-1000/454)	ORM-E	NA9100	None	None	173.510	No limit	No limit	1,2	1,2	
E	Chromic trioxide. See Chromic acid, solid										
	Chromium oxychloride or Chromyl chloride	Corrosive material	UN1758	Corrosive	None	173.247	Forbidden	1 gallon	1	1	5
E	Chromous chloride (RQ-1000/454)	ORM-E	NA9102	None	None	173.510	No limit	No limit	1,2	1,2	
	Cigar and cigarette lighter fluid. See Lighter fluid										
	Cigarette lighter (or other similar ignition device)	Flammable gas	UN1057	Flammable gas	173.21 175.10	173.308	21 ounces	25 pounds	1	1	
	Cigarette lighter (or other similar ignition device)	Flammable liquid	UN1226	Flammable liquid	173.21 175.10	173.118	Forbidden	Forbidden	1	1	
	Cigarette load	Class C explosive		Explosive C	None	173.111	50 pounds	150 pounds	1,2	1,2	
	Cloud gas cylinder. See Chemical ammunition, nonexplosive										

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§172.101 HAZARDOUS MATERIALS TABLE

(1) +/ E/ A/ W/	(2) Hazardous materials descriptions and proper shipping names	(3) Hazard class	(3A) ID Number	(4) Label(s) required (if not excepted)	(5) Packaging		(6) Maximum net quantity in one package		(7) Water Shipments		
					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
	Coal briquettes, hot	Forbidden									
	Coal facings. See Coal ground bituminous, etc.										
	Coal gas. See Hydrocarbon gas, nonliquefied										
	Coal, ground bituminous, sea coal, coal facings, etc.	Flammable solid	NA1361	Flammable solid	173.165		Forbidden	Forbidden	1	1	29
	Coal oil (export shipment only). See Kerosene										
	Coal tar distillate	Combustible liquid	UN1137	None	173.118a	None	No limit	No limit	1.2	1,2	
	Coal tar distillate	Flammable liquid	UN1136	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	Coal tar dye, liquid (not otherwise specifically named in 172.101)	Corrosive material	NA2801	Corrosive	173.244	173.249a	1 quart	10 gallons	1,2	1,2	
	Coal tar light oil	Combustible liquid	NA1137	None	173.118a	None	No limit	No limit	1,2	1,2	
	Coal tar light oil	Flammable liquid	NA1136	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	Coal tar naptha	Combustible liquid	NA2553	None	173.118a	None	No limit	No limit	1,2	1,2	
	Coal tar naptha	Flammable liquid	NA2553	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	Coal tar oil	Combustible liquid	NA1137	None	173.118a	None	No limit	No limit	1,2	1,2	
	Coal tar oil	Flammable liquid	NA1136	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1,2	
	Coating solution	Flammable liquid	UN1139	Flammable liquid	173.118	173.132	1 quart	15 gallons	1,2	1	
E	Cobaltous bromide (RQ-1000/454)	ORM-E	NA9103	None	None	173.510	No limit	No limit	1,2	1,2	
E	Cobaltous formate (RQ-1000/454)	ORM-E	NA9104	None	None	173.510	No limit	No limit	1,2	1,2	
E	Cobaltous sulfamate (RQ-1000/454)	ORM-E	NA9105	None	None	173.510	No limit	No limit	1,2	1,2	
	Cobalt resinate, precipitated	Flammable solid	UN1318	Flammable solid	None	173.166	Forbidden	125 pounds	1,2	1,2	
	Cocculus, solid (fishberry)	Poison B	UN1584	Poison	173.364	173.365	50 pounds	200 pounds	1,2	1,2	
W	Coconut meal pellets containing at least 5% and not more than 13% moisture and not more than 10% residual fat content	ORM-C		None	173.505	173.955			1,2	4	13
	Coir. See Fibers										
	Coke, hot	Forbidden									
	Collodion	Flammable liquid	NA2059	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	Cologne spirits (alcohol)	Flammable liquid	NA1170	Flammable liquid	173.118	173.125	1 quart	10 gallons	1,2	1	
	Columbian spirits (wood alcohol)	Flammable liquid	NA1230	Flammable liquid	173.118	173.125	1 quart	10 gallons	1,2	1	

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§172.101 HAZARDOUS MATERIALS TABLE

(1) +/ E/ A/ W/	(2) Hazardous materials descriptions and proper shipping names	(3) Hazard class	(3A) ID Number	(4) Label(s) required (if not excepted)	(5) Packaging		(6) Maximum net quantity in one package		(7) Water Shipments		
					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
	Combination fuze	Class C explosive		Explosive C	None	173.105	50 pounds	150 pounds	1,3	1,3	
	Combination primer	Class C explosive			None	173.107	50 pounds	150 pounds	1,3	5	
	Combustible liquid, n.o.s.	Combusti- ble liquid	NA1993	None	173.118a	None	No limit	No limit	1,2	1,2	
	<i>Commercial shaped charge. See High explosive</i>										
	<i>Common fireworks. See Fire- works, common</i>										
	Compound, cleaning, liquid	Flammable liquid	NA1993	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	Compound, cleaning, liquid	Corrosive material	NA1760	Corrosive	173.244	173.245	1 quart	1 quart	1,2	1,2	
	Compound, cleaning, liquid	Combusti- ble liquid	NA1993	None	173.118a	None	No limit	No limit	1,2	1,2	
	Compound, cleaning, liquid (containing phosphoric acid, acetic acid, sodium hydroxide or potassium hydroxide)	Corrosive material	NA1760	Corrosive	173.244	173.249a	1 quart	1 quart	1,2	1,2	
	Compound, cleaning, liquid (containing hydrochloric (muriatic) acid)	Corrosive material	NA1789	Corrosive	173.244	173.263	1 quart	1 gallon	1	1	
	Compound, cleaning, liquid (containing hydrofluoric acid)	Corrosive material	NA1790	Corrosive	173.244	173.256	1 quart	1 gallon	1	4	
	Compound, enamel	Flammable liquid	NA1263	Flammable liquid	173.118	173.128	1 quart	55 gallons	1,2	1	
	Compound, lacquer, paint, or varnish, removing, reducing, or thinning, liquid	Combusti- ble liquid	NA1142	None	173.118a				1,2	1,2	
	Compound, lacquer, paint, or varnish removing, liquid	Corrosive material	NA1760	Corrosive	173.244	173.245	1 quart	1 gallon	1,2	1,2	
	Compound, lacquer, paint or varnish, removing, reducing, or thinning, liquid	Flammable liquid	NA1142	Flammable liquid	173.118	173.128	1 quart	55 gallons	1,2	1	
	Compound, polishing, liquid	Flammable liquid	NA1142	Flammable liquid	173.118	173.129	1 quart	55 gallons	1,2	1	
	Compound, rust preventing or Compound, rust removing	Corrosive material	NA1760	Corrosive	173.244	173.245	1 quart	1 gallon	1,2	1,2	
	Compound, tree or weed killing, liquid	Combusti- ble liquid	NA1993	None	173.118a	None	No limit	No limit	1,2	1,2	
	Compound, tree or weed killing, liquid	Corrosive material	NA1760	Corrosive	173.244	173.245	1 quart	1 quart	1,2	1,2	
	Compound, tree or weed killing, liquid	Flammable liquid	NA1993	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	Compound, tree or weed killing, liquid	Poison B	NA2810	Poison	173.345	173.346	1 quart	55 gallons	1,2	1,2	
	Compound, tree or weed killing, solid	Oxidizer	NA1479	Oxidizer	173.153	173.154 173.229	25 pounds	100 pounds			
	Compound, vulcanizing, liquid	Corrosive material	NA1760	Corrosive	173.244	173.245	1 quart	1 quart	1,2	1,2	
	Compound, vulcanizing, liquid	Flammable liquid	NA1142	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	Compound, water treatment, liquid. See Water treatment, liquid										

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(1) +/ E/ A/ W/	(2) Hazardous materials descriptions and proper shipping names	(3) Hazard class	(3A) ID Number	(4) Label(s) required (if not excepted)	(5) Packaging		(6) Maximum net quantity in one package		(7) Water Shipments		
					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
	Compressed gas, n.o.s.	Flammable gas	UN1954	Flammable gas	173.306	173.302 173.304 173.305	Forbidden	300 pounds	1	4	
	Compressed gas, n.o.s.	Non- flammable gas	UN1956	Non- flammable gas	173.306 173.307	173.302 173.304 173.305	150 pounds	300 pounds	1,2	1,2	
	Consumer commodity	ORM-D		None	173.505b	173.510 173.1200	65 pounds gross	65 pounds gross			62
	<i>Container, reused or empty, must be classed for the hazardous material previously contained. See 173.28, 173.29</i>										
E	Copper acetoarsenite, solid (RQ-100/45.4)	Poison B	UN1585	Poison	173.364	173.367	50 pounds	200 pounds	1,2	1,2	
	Copper acetylide	Forbidden									
	Copper amine oxide	Forbidden									
	Copper arsenite, solid	Poison B	UN1586	Poison	173.364	173.365	50 pounds	200 pounds	1,2	1,2	
	Copper based pesticide, liquid, n.o.s. (compounds and prepara- tions)	Flammable liquid	UN2776	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	Copper based pesticide, liquid, n.o.s. (compounds and prepara- tions)	Poison B	UN2775	Poison	173.345	173.346	1 quart	55 gallons	1,2	1,2	
	Copper based pesticide, solid, n.o.s. (compounds and prepara- tions)	Poison B	UN2775	Poison	173.364	173.365	50 pounds	200 pounds	1,2	1,2	
EA	Copper chloride (RQ-10/4.54)	ORM-B	UN2802	None	173.505	173.800	25 pounds	100 pounds	1,2	1,2	
	Copper cyanide	Poison B	UN1587	Poison	173.370	173.370	25 pounds	200 pounds	1,2	1,2	32
	Copper tetramine nitrate	Forbidden									
W	Copra	ORM-C	UN1363	None	173.505	173.960			1,2	1,2	63
	Copra pellets. See Coconut meal pellets										
	Cordeau detonant fuse	Class C explosive		Explosive C	None	173.104	50 pounds	300 pounds	1,2	1,2	
	Corrosive liquid, n.o.s.	Corrosive material	UN1760	Corrosive	173.244	173.245 173.245a	1 quart	1 quart	1	4	64
	Corrosive liquid, poisonous, n.o.s.	Corrosive and Poison	UN2992	Corrosive	173.244	173.245	1 quart	1 quart	1	4	
	Corrosive solid, n.o.s.	Corrosive material	UN1759	Corrosive	173.244	173.245b	25 pounds	100 pounds	1	4	64
	Cosmetics, liquid, n.o.s.	Corrosive material	NA1760	Corrosive	173.244	173.245	1 quart	1 quart	1,2	1,2	
	Cosmetics, n.o.s.	Combusti- ble liquid	NA1993	None	173.118a	None	No limit	No limit	1,2	1,2	
	Cosmetics, n.o.s.	Flammable liquid	NA1993	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	Cosmetics, n.o.s.	Flammable solid	NA1325	Flammable solid	173.153	173.154	25 pounds	100 pounds	1,2	1,2	
	Cosmetics, n.o.s.	Oxidizer	NA1479	Oxidizer	173.153	173.154	25 pounds	100 pounds	1,2	1,2	
	Cosmetics, solid, n.o.s.	Corrosive material									

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(1) ♦/ E/ A/ W/	(2) Hazardous materials descriptions and proper shipping names	(3) Hazard class	(3A) ID Number	(4) Label(s) required (if not excepted)	(5) Packaging		(6) Maximum net quantity in one package		(7) Water Shipments		
					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
W	Cotton	ORM-C		None	173.505	173.965			1,2	1,2	65
W	Cotton batting	ORM-C		None	173.505	173.970			1,2	1,2	66
W	Cotton batting dross. <i>See</i> Cotton batting										
	<i>Cotton, burnt. See Burnt cotton</i>										
W	Cotton seed hull fiber <i>or</i> shavings, pulp, <i>or</i> cut linters. <i>See</i> Cotton batting										
	Cotton sweepings. <i>See</i> Cotton waste										
W	Cotton wadding. <i>See</i> Cotton batting.										
W	Cotton waste	ORM-C		None	173.505	173.975			1,2	1,2	66
	Cotton waste, oily (<i>with more than 5% of animal or vegetable oil</i>)	Flammable solid	UN1364	Flammable solid			Forbidden	Forbidden	1,2	1,2	29
E	Coumaphos (RQ-10/4.54)	Poison B	NA2783	Poison	173.364	173.365	50 pounds	200 pounds	1,2	1,2	
E	Coumaphos mixture, liquid (RQ-10/4.54)	Poison B	NA2783	Poison	173.365	173.366	1/2 pint	1 quart	1,2	1,2	
	Creosote, coal tar	Combust- ible liquid	NA1993	None	173.118a	None	No limit	No limit	1,2	1,2	
	<i>Creosote oil. See</i> Creosote coal tar										
	Cresol (RQ-100/45.4)	Corrosive material	UN2076	Corrosive	173.244	173.245	1 quart	10 gallons	1,2	1,2	
E	Crotonaldehyde (RQ-100/45.4)	Flammable liquid	UN1143	Flammable liquid and Poison	173.118	173.119	1 quart	1 gallon	1,2	1	
	Crotonic acid	Corrosive material	UN2823	Corrosive	173.244	173.245	1 quart	10 gallons	1,2	1,2	
	Crotonylene	Flammable liquid	UN1144	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,3	4	
	Crude nitrogen fertilizer solution (<i>more than 25.3 p.e.t.g.</i>)	Non- flammable gas	NA1043	Non- flammable gas	173.306	173.304 173.314	Forbidden	300 pounds	1,3	1,3	
	Crude oil, petroleum	Combust- ible liquid	UN1267	None	173.118a	None	No limit	No limit	1,2	1,2	
	Crude oil, petroleum	Flammable liquid	UN1267	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	Cumene hydroperoxide	Organic peroxide	UN2116	Organic peroxide	173.153	173.224	1 quart	1 quart	1,2	4	
	Cumene hydroperoxide, <i>tech- nically pure. See</i> Cumene hydroperoxide		UN2116								
E	Cupric acetate (RQ-100/45.4)	ORM-E	NA9106	None	None	173.510	No limit	No limit	1,2	1,2	
	<i>Cupric cyanide. See</i> Copper cyanide										
E	Cupric nitrate (RQ-100/45.4)	Oxidizer	NA1479	Oxidizer	173.153	173.182	25 pounds	100 pounds	1,2	1,2	
E	Cupric oxalate (RQ-100/45.4)	ORM-E	NA2449	None	None	173.510	No limit	No limit	1,2	1,2	

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(1) +/ E/ A/ W/	(2) Hazardous materials descriptions and proper shipping names	(3) Hazard class	(3A) ID Number	(4) Label(s) required (if not excepted)	(5) Packaging		(6) Maximum net quantity in one package		(7) Water Shipments		
					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
E	Cupric sulfate (RQ-10/4.54)	ORM-E	NA9109	None	None	173.510	No limit	No limit	1,2	1,2	
E	Cupric sulfate, ammoniated (RQ-100/45.4)	ORM-E	NA9110	None	None	173.510	No limit	No limit	1,2	1,2	
E	Cupric tartrate (RQ-100/45.4)	ORM-E	NA9111	None	None	173.510	No limit	No limit	1,2	1,2	
	Cupriethylene-diamine solution	Corrosive material	UN1761	Corrosive	173.244	173.249	1 quart	1 gallon	1,2	1,2	
	Cyanide or cyanide mixture, dry	Poison B	UN1588	Poison	173.364	173.370	25 pounds	200 pounds	1,2	1,2	67
	Cyanide solution, n.o.s.	Poison B	UN1935	Poison	173.345	173.352	1 quart	55 gallons	1,2	1,2	32
	Cyanogen bromide	Poison B	UN1889	Poison	None	173.379	Forbidden	25 pounds	1	5	41
E	Cyanogen chloride (containing less than 0.9% water (RQ-10/4.54)	Poison A	UN1589	Poison gas and Flammable gas	None	173.328	Forbidden	Forbidden	1	5	4
	Cyanogen gas	Poison A	UN1026	Poison gas and Flammable gas	None	173.328	Forbidden	Forbidden	1	5	72
	Cyanuric triazide	Forbidden									
E	Cyclohexane (RQ-1000/454)	Flammable liquid	UN1145	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,3	4	
	Cyclohexanone peroxide, 50 to 85% peroxide	Organic peroxide	UN2119	Organic peroxide	173.157	173.158	Forbidden	25 pounds	1	1	
	Cyclohexanone peroxide, as a paste with not more than 9% by weight active oxygen. See Cyclohexanone peroxide, 50 to 85% peroxide		UN2896								
	Cyclohexanone peroxide, in solu- tion with not more than 9% by weight active oxygen. See Cyclo- hexanone peroxide, 50 to 85% peroxide		UN2118								
	Cyclohexanone peroxide, not over 50% peroxide	Organic peroxide	UN2896	Organic peroxide	173.153	173.154	2 pounds	25 pounds	1,2	1,2	
	Cyclohexanone peroxide and di- (1-hydroxy cyclohexyl) peroxide mixture. See appropriate cyclo- hexanone peroxide entry										
	Cyclohexenyl trichlorosilane	Corrosive material	UN1762	Corrosive	None	173.280	Forbidden	10 gallons	1	1	13
	Cyclohexylamine	Flammable liquid	UN2357	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	Cyclohexyl trichlorosilane	Corrosive material	UN1763	Corrosive	None	173.280	Forbidden	10 gallons	1	1	13
	Cyclopentane	Flammable liquid	UN1146	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,3	4	
	Cyclopentane, methyl	Flammable liquid	UN2298	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,3	4	
	Cyclopropane	Flammable gas	UN1027	Flammable gas	173.306	173.304	Forbidden	300 pounds	1,2	1	
	Cyclotetramethylene tetranitram- ine (dry) (HMX)	Forbidden									
	Cyclotetramethylene tetranitram- ine, wet with not less than 10% water. See High explosive										

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					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
	<i>Cyclotrimethylene trinitramine, desensitized. See High explosive</i>										
	<i>Cyclotrimethylene trinitramine, wet with not less than 10% water. See High explosive</i>										
	<i>Cylinder, empty, including ton tanks, must be classed for the hazardous material previously contained in cylinder. See 173.29</i>										
EA	2,4-D. See 2,4-Dichlorophenoxy-acetic acid										
EA	DDT or Dichlorodiphenyltri-chloroethane (RQ-1/0.454)	ORM-A	NA2761	None	173.505	173.510	No limit	No limit	1,2	1,2	
	<i>Dead oil. See Creosote, coal tar</i>										
	Decaborane	Flammable solid	UN1868	Flammable solid and Poison	173.236	Forbidden	No limit	No limit	1,2	1,2	
	Decahydronaphthalene	Combustible liquid	UN1147	None	173.118	None	No limit	No limit	1,2	1,2	
	<i>Decalin. See Decahydronaphthalene</i>										
	Decanoyl peroxide, technically pure. See Organic peroxide, solid, n.o.s.		UN2120								
	<i>Delay connectors. See Detonators, Class A or Class C explosives and Detonating primers, Class A or Class C explosives</i>										
	Delay electric igniter	Class C explosive		Explosive C	None	173.106	50 pounds	150 pounds	1,3	1,3	
	Denatured alcohol.	Flammable liquid	NA1986	Flammable liquid	173.118	173.125	1 quart	10 gallons	1,2	1	
	<i>Depth bomb. See Explosive bomb</i>										
EA	2,4-D ester. See 2,4-Dichloro-phenoxyacetic acid ester										
	Detonating fuze, Class A, with or without radioactive components	Class A explosive		Explosive A	None	173.69	Forbidden	Forbidden	6	5	
	Detonating fuze, Class C explosive	Class C explosive		Explosive C	None	173.113	50 pounds	150 pounds	1,3	1,3	
	Detonating primers, Class A explosives. See 173.53	Class A explosive		Explosive A	None	173.68	Forbidden	Forbidden	6	5	148
	Detonating primers, Class C explosives. See 173.100	Class C explosive		Explosive C	None	173.68	173.103(d)	150 pounds	1,2	1,2	149
	Detonators, Class A explosives. See 173.53	Class A explosive		Explosive A	None	173.66	Forbidden	Forbidden	6		150
	Detonators, Class C explosives. See 173.100	Class C explosive		Explosive C	None	173.66	173.103(d)	150 pounds	1,2	1,2	151
	<i>Detonators, commercial. See Detonators, Class A or Class C explosives</i>										
	Di-(1-hydroxycyclohexyl) peroxide, technically pure. See Organic peroxide, solid, n.o.s.		UN2148								
	<i>Di-(1-hydroxytetrazole) (dry)</i>	Forbidden									
	<i>Di-(1-naphthyl) peroxide</i>	Forbidden									

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(1) * E/ A/ W/	(2) Hazardous materials descriptions and proper shipping names	(3) Hazard class	(3A) ID Number	(4) Label(s) required (if not excepted)	(5) Packaging		(6) Maximum net quantity in one package		(7) Water Shipments		
					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
	Di-(2-ethylhexyl) peroxydicarbo- nate, <i>technically pure</i> . See Organic peroxide, liquid or solution, n.o.s.		UN2122								
	Di-(2-ethylhexyl) peroxydicar- bonate, <i>not more than 67% in solution</i> . See Organic peroxide liquid or solution, n.o.s.		UN2123								
	Di-(2-ethylhexyl) phosphoric acid	Corrosive material	NA1902	Corrosive	173.244	173.245	1 quart	10 gallons	1,2	1,2	
	Di-(2-methylbenzoyl) peroxide, <i>not more than 85% with water</i> . See Organic peroxide, solid, n.o.s.		UN2593								
	1,3-Di-(2-tert-butylperoxyiso- propyl) benzene, <i>technically pure or more than 40% with inert solid</i> . See Organic peroxide, solid, n.o.s.		UN2112								
	1,3-Di-(2-tert-butylperoxyiso- propyl) benzene and 1,4-Di-(2- tert-butylperoxyisopropyl) benzene mixture, <i>technically pure or more than 40% with inert solid</i> . See Organic peroxide, solid, n.o.s.		UN2112								
	1,4-Di-(2-tert-butylperoxyisopro- pyl) benzene, <i>technically pure or more than 40% with inert solid</i> . See Organic peroxide, solid, n.o.s.		UN2112								
	Di-(1,5,5-trimethyl-1,2-Dioxo- lanyl-3) peroxide, <i>not more than 50% as a paste, with phlegma- tizer</i> . See Organic peroxide, solid, n.o.s.		UN2597								
	2,2-Di-(4,4-di-tert-butylperoxy- cyclohexyl) propane, <i>not more than 42% with inert solid</i> . See Organic peroxide, solid, n.o.s.		UN2168								
	2,2-Di-(4,4-di-tert-butylperoxy- cyclohexyl) propane, <i>not more than 42% with inert solid</i>	Forbidden									
	Di-(4-tert-butylcyclohexyl) peroxydicarbonate, <i>technically pure</i> . See Organic peroxide, solid, n.o.s.		UN2154								
	Di-(4-tert-butylcyclohexyl) peroxydicarbonate, <i>not more than 42%, stable dispersion, in water</i> . See Organic peroxide, liquid or solution, n.o.s.		UN2894								
	Diacetone alcohol	Flammable liquid	UN1148	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	Diacetone alcohol peroxide, <i>not more than 57% in solution with not more than 9% hydrogen peroxide, not less than 26% diacetone alcohol and not less than 3% water; total active oxygen content not more than 9%</i> . See Organic peroxide, liquid or solution, n.o.s.		UN2163								

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(1) +/ E/ A/ W/	(2) Hazardous materials descriptions and proper shipping names	(3) Hazard class	(3A) ID Number	(4) Label(s) required (if not excepted)	(5) Packaging		(6) Maximum net quantity in one package		(7) Water Shipments		
					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
	<i>Diacetone alcohol peroxides, more than 57% in solution with more than 3% hydrogen peroxide, less than 28% diacetone alcohol and less than 9% water; total active oxygen content more than 9% by weight</i>	Forbidden									
	Diacetyl	Flammable liquid	UN2346	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	<i>p</i> -Diazidobenzene	Forbidden									
	1,2-Diazirioethane	Forbidden									
EA	Diazinon (RQ-1/0.454)	ORM-A	NA2783	None	173.505	173.510	No limit	No limit	1,2	1,2	
	1,1'-Diazaminonaphthalene	Forbidden									
	Diazoaminotetrazole (dry)	Forbidden									
	Diazodinitrophenol. See Initiating explosive										
	Diazodinitrophenol (dry)	Forbidden									
	Diazodiphenylmethane	Forbidden									
	Diazonium nitrates (dry)	Forbidden									
	Diazonium perchlorates (dry)	Forbidden									
	1,3-Diazopropane	Forbidden									
	Dibenzyl peroxydicarbonate, not more than 87% with water. See Organic peroxide, solid, n.o.s.		UN2149								
	Dibenzyl peroxydicarbonate, more than 87% with water	Forbidden									
	Di-(beta-nitroxyethyl) ammonium nitrate	Forbidden									
+	Diborane or diborane mixtures	Flammable gas	UN1911	Flammable gas and Poison	None	173.302	Forbidden	Forbidden	1	5	145
	Dibromoacetylene	Forbidden									
A	Dibromodifluoromethane	ORM-A	UN1941	None	173.505	173.605	10 gallons	55 gallons			
EW	1,2-Dibromoethane. See Ethylene dibromide										
E	Dicamba (RQ-1000/454)	ORM-E	UN2895	None	None	173.510	No limit	No limit	1,2	1,2	
	Dicetyl peroxydicarbonate, not more than 42%, stable dispersion, in water. See Organic peroxide, liquid or solution, n.o.s.										
	Dicetyl peroxydicarbonate, technically pure. See Organic peroxide, solid, n.o.s.		UN2164								
E	Dichlobenil (RQ-1000/454)	ORM-E	NA2769	None	None	173.510	No limit	No limit	1,2	1,2	
E	Dichlone (RQ-1/0.454)	ORM-E	NA2761	None	None	173.510	No limit	No limit	1,2	1,2	
	N,N'-Dichlorazodiazarboramidine (salts of), (dry)	Forbidden									
E	1,1-Dichloro-2,2 bis(parmachlorophenyl) ethane. See TDE										
	Dichloroacetic acid	Corrosive material	UN1764	Corrosive	173.244	173.245	1 quart	1 quart	1,2	1,2	7

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					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
	Dichloroacetyl chloride	Corrosive material	UN1765	Corrosive	173.244	173.247	1 quart	1 gallon	1	4	13
	<i>Dichloroacetylene</i>	Forbidden									
EA	Dichlorobenzene, ortho, liquid (RQ-100/45.4)	ORM-A	UN1591	None	173.505	173.510	No limit	No limit	1,2	1,2	
EA	Dichlorobenzene, para, solid (RQ-100/45.4)	ORM-A	UN1592	None	173.505	173.510	No limit	No limit	1,2	1,2	
	2,4-Dichlorobenzoyl peroxide, not more than 75% with water. See Organic peroxide, solid, n.o.s.		UN2137								
	2,4-Dichlorobenzoyl peroxide, not more than 52% as a paste. See Organic peroxide, solid, n.o.s.		UN2138								
	2,4-Dichlorobenzoyl peroxide, not more than 52% in solution. See Organic peroxide, liquid or solution, n.o.s.		UN2139								
	2,4-Dichlorobenzoyl peroxide more than 75% with water	Forbidden									
	Dichlorobutene	Flammable liquid	NA2924	Flammable liquid	173.118	173.119	10 gallons	1 quart	1,2	1	
	Dichlorobutene	Corrosive material	NA2924	Corrosive	173.244	173.245 173.245a	1 quart	10 gallons	1	4	
A	Dichlorodifluoroethylene	ORM-A	NA9018	None	173.505	173.605	10 gallons	55 gallons			
	Dichlorodifluoromethane	Non- flammable gas	UN1028	Non- flammable gas	173.306	173.304 173.314 173.315	150 pounds	300 pounds	1,2	1,2	
	Dichlorodifluoromethane and difluoroethane mixture (constant boiling mixture)	Non- flammable gas	UN2602	Non- flammable gas	173.306	173.304 173.314 173.315	150 pounds	300 pounds	1,2	1,2	
	Dichlorodifluoromethane- dichlorotetrafluoroethane mixture	Non- flammable gas	NA1956	Non- flammable gas	173.306	173.304 173.314 173.315	150 pounds	300 pounds	1,2	1,2	
	Dichlorodifluoromethane monochlorodifluoroethane mixture	Non- flammable gas	NA1956	Non- flammable gas	173.306	173.304 173.314 173.315	150 pounds	300 pounds	1,2	1,2	
	Dichlorodifluoromethane- trichloromonofluoromethane mixture	Non- flammable gas	NA1956	Non- flammable gas	173.306	173.304 173.314 173.315	150 pounds	300 pounds	1,2	1,2	
	Dichlorodifluoromethane- trichloromonofluoromethane- monochlorodifluoroethane mixture	Non- flammable gas	NA1956	Non- flammable gas	173.306	173.304 173.314 173.315	150 pounds	300 pounds	1,2	1,2	
	Dichlorodifluoromethane- trichlorotrifluoroethane mixture	Non- flammable gas	NA1956	Non- flammable gas	173.306	173.304 173.314 173.315	150 pounds	300 pounds	1,2	1,2	
EA	Dichlorodiphenyltrichloroethane. See DDT										
	Dichloroethylene	Flammable liquid	UN1150	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	Dichloroisopropyl ether	Corrosive material	UN2490	Corrosive	173.244	173.254	1 quart	10 gallons	1,2	1,2	
A	Dichloromethane OR Methylene chloride	ORM-A	UN1593	None	173.505	173.605	10 gallons	55 gallons			
	Dichloropentane	Flammable liquid	UN1152	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1,2	

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					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
EA	2,4-Dichlorophenoxyacetic acid (RQ-100/45.4)	ORM-A	NA2765	None	173.505	173.510	50 pounds	No limit	1,2	1,2	
E	2,4-Dichlorophenoxyacetic acid ester (RQ-100/45.4)	ORM-E	NA2765	None	None	173.510	No limit	No limit	1,2	1,2	
	Dichlorophenyltrichlorosilane	Corrosive material	UN1766	Corrosive	None	173.280	Forbidden	10 gallons	1	1	13
E	Dichloropropane. <i>See</i> Propylene dichloride										
E	Dichloropropene (RQ-5000/2270)	Flammable liquid	UN2047	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	Dichloropropene and propylene dichloride mixture	Flammable liquid	NA2047	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
E	2,2-Dichloropropionic acid (RQ-5000/2270)	Corrosive material	NA1760	Corrosive	173.244	173.245	1 quart	10 gallons	1,2	1,2	
E	Dichlorvos (RQ-10/4.54)	Poison B	NA2783	Poison	173.345	173.346	Forbidden	1 quart	1,2	1,2	
E	Dichlorvos mixture dry (RQ-10/4.54)	Poison B	NA2783	Poison	173.366	173.345	50 pounds	200 pounds	1,2	1,2	
	Dicumyl peroxide 50% solution	Organic peroxide	NA2121	Organic peroxide	173.153	173.224	1 quart	1 quart	1,2	4	
	Dicumyl peroxide, technically pure or Dicumyl peroxide, with inert solid. <i>See</i> Dicumyl peroxide, dry.		UN2121								
	Dicumyl peroxide, dry	Organic peroxide	UN2121	Organic peroxide	173.153	173.154	2 pounds	25 pounds	1,2	1,2	
	Dicyclohexyl peroxydicarbonate, technically pure. <i>See</i> Organic peroxide, solid, n.o.s.		UN2152								
	Dicyclohexyl peroxydicarbonate, not more than 91% with water. <i>See</i> Organic peroxide, solid, n.o.s.		UN2153								
EA	Dieldrin (RQ-1/0.464)	ORM-A	NA2761	None	173.505	173.510	No limit	No limit	1,2	1,2	
	Diesel fuel. <i>See</i> Fuel oil										
	Diethanol nitrosamine dinitrate (dry)	Forbidden									
E	Diethylamine (RQ-1000/454)	Flammable liquid	UN1154	Flammable liquid	173.118	173.119	Forbidden	5 pints	1,3	4	
	Diethyl cellosolve. <i>See</i> Ethylene glycol diethyl ether										
	Diethyl dichlorosilane	Flammable liquid	UN1767	Flammable liquid	None	173.135	Forbidden	10 gallons	1	1	68
	Diethylene glycol dinitrate. <i>See</i> 173.51	Forbidden									
	Diethylgold bromide	Forbidden									
	Diethyl ketone	Flammable liquid	UN1156	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	Diethyl peroxydicarbonate, not more than 27% in solution. <i>See</i> Organic peroxide, liquid or solution, n.o.s.		UN2175								
	Diethyl peroxydicarbonate, more than 27% in solution	Forbidden									
	Diethylzinc. <i>See</i> Pyrophoric liquid, n.o.s.										

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(1) +/ E/ A/ W/	(2) Hazardous materials descriptions and proper shipping names	(3) Hazard class	(3A) ID Number	(4) Label(s) required (if not excepted)	(5) Packaging		(6) Maximum net quantity in one package		(7) Water Shipments		
					(a)	(b)	(a)	(b)	(a)	(b)	(c)
					Excep- tions	Specific require- ments	Passenger carrying aircraft or railcar	Cargo only aircraft	Cargo vessel	Pas- senger vessel	Other require- ments See Sec. 172.101(i)
	1,1-Difluoro-1-chloroethane. <i>See</i> Difluoromonochloroethane										
+	Difluoroethane	Flammable gas	UN1030	Flammable gas	173.306	173.304 173.314 173.315	Forbidden	300 pounds	1,2	1	
+	Difluoromonochloroethane	Flammable gas	UN2517	Flammable gas	173.306	173.304 173.314 173.315	Forbidden	300 pounds	1,2	1	
	Difluorophosphoric acid, anhydrous	Corrosive material	UN1768	Corrosive	None	173.275	Forbidden	1 gallon	1,2	1,2	
	2,2-Dihydroperoxy propane, <i>not more than 25% with inert organic solid. See Organic peroxide, solid, n.o.s.</i>		UN2178								
	Dihydropyran	Flammable liquid	UN2376	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	4	
	1,8-Dihydroxy-2,4,5,7-tetra- nitroanthraquinone (<i>chrysam- mic acid</i>)	Forbidden									
	Diiodoacetylene	Forbidden									
	Diisobutyl ketone	Combusti- ble liquid	UN1157	None	173.118a	None	No limit	No limit	1,2	1,2	
	Diisobutyl peroxide, <i>not more than 52% in solution. See Organic peroxide, liquid or solution, n.o.s.</i>		UN2182								
	Diisooctyl acid phosphate	Corrosive material	UN1902	Corrosive	173.144	173.296	1 quart	1 quart	1,2	1,2	7
	Diisopropylamine	Flammable liquid	UN1158	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	Diisopropylbenzene hydroperoxide solution, <i>not over 72% peroxide</i>	Organic peroxide	UN2171	Organic peroxide	173.153	173.224	1 quart	1 quart	1,2	4	
	Diisopropylbenzene hydroperoxide, <i>not more than 72% in solution. See Diisopropylbenzene hydro- peroxide solution, not more than 72% peroxide.</i>		UN2171								
	Diisopropylbenzene hydroperoxide, <i>more than 72% in solution.</i>	Forbidden									
	Diisopropyl ether	Flammable liquid	UN1159	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,3	4	
	Diisotridecyl peroxydicarbonate, <i>technically pure. See Organic peroxide, liquid or solution, n.o.s.</i>		UN2889								
	2,5-Dimethyl-2,5-di(2-ethyl- hexan-1-ylperoxy) hexane, <i>tech- nically pure. See Organic peroxide, liquid or solution, n.o.s.</i>		UN2157								
	2,5-Dimethyl-2,5-di(benzoyl- peroxy) hexane, <i>technically pure. See Organic peroxide, solid, n.o.s.</i>		UN2172								
	2,5-Dimethyl-2,5-di(benzoyl- peroxy) hexane, <i>not more than 82% with inert solid. See Organic peroxide, solid, n.o.s.</i>		UN2173								

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(1) +/ E/ A/ W/	(2) Hazardous materials descriptions and proper shipping names	(3) Hazard class	(3A) ID Number	(4) Label(s) required (if not excepted)	(5) Packaging		(6) Maximum net quantity in one package		(7) Water Shipments		
					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
	2,5-Dimethyl-2,5-dihydroperoxy hexane, <i>not more than 82% with water. See Dimethylhexane dihydroperoxide, with 19% or more water.</i>		UN2174								
	2,5-Dimethyl-2,5-dihydroperoxy hexane, <i>more than 82% with water</i>	Forbidden									
	2,5-Dimethyl-2,5-di-(tert-butyl- peroxy) hexane, <i>technically pure.</i> <i>See Organic peroxide, liquid or solution, n.o.s.</i>		UN2155								
	2,5-Dimethyl-2,5-di-(tert-butyl- peroxy) hexane, <i>not more than 52% with inert solid. See Organic peroxide, solid n.o.s.</i>		UN2156								
	2,5-Dimethyl-2,5-di-(tert-butyl- peroxy) hexyne-3, <i>technically pure. See Organic peroxide, liquid or solution, n.o.s.</i>		UN2158								
	2,5-Dimethyl-2,5-di-(tert-butyl- peroxy) hexyne-3, <i>not more than 52% with inert solid. See Organic peroxide, solid, n.o.s.</i>		UN2159								
+E	Dimethylamine, anhydrous (RQ-1000/454)	Flammable gas	UN1032	Flammable gas	173.306	173.304 173.314 173.315	Forbidden	300 pounds	1,2	4	
E	Dimethylamine, aqueous solution (RQ-1000/454)	Flammable liquid	UN1160	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	2,3-Dimethylbutane	Flammable liquid	UN2457	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,3	4	
	Dimethyl carbonate	Flammable liquid	UN1161	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	Dimethyl chlorothiophosphate	Corrosive material	NA2922	Corrosive	173.244	173.245	1 quart	1 quart	1,2	1,2	
	1,4-Dimethylcyclohexane	Flammable liquid	UN2263	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	Dimethyldichlorosilane	Flammable liquid	UN1162	Flammable liquid	None	173.135	Forbidden	5 pints	1,2	1	
+	Dimethyl ether	Flammable gas	UN1033	Flammable gas	173.306	173.304 173.314 173.315	Forbidden	300 pounds	1,2	1	
	Dimethylhexane dihydroperoxide (dry)	Forbidden									
	Dimethylhexane dihydroperoxide (with 18% or more water)	Organic peroxide	UN2174	Organic peroxide	None	173.157	Forbidden	25 pounds	1	1	
	Dimethylhydrazine, unsymmetrical (UDMH)	Flammable liquid	UN1163	Flammable liquid and Poison	None	173.145	Forbidden	5 pints	1,2	1	69
	Dimethyl phosphorochlorido- thioate. <i>See Dimethyl chloro- thiophosphate.</i>										
	Dimethyl sulfate	Corrosive material	UN1595	Corrosive	None	173.255	Forbidden	1 quart	1	5	8
	Dimethyl sulfide	Flammable liquid	UN1164	Flammable liquid	None	173.119	Forbidden	10 gallons	1,2	5	
	Dimyristyl peroxydicarbonate, <i>technically pure. See Organic peroxide, solid, n.o.s.</i>		UN2595								

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(1) +/ E/ A/ W/	(2) Hazardous materials descriptions and proper shipping names	(3) Hazard class	(3A) ID Number	(4) Label(s) required (if not excepted)	(5) Packaging		(6) Maximum net quantity in one package		(7) Water Shipments		
					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
	Dimyristyl peroxydicarbonate, <i>not more than 22%, stable dispersion, in water. See Organic peroxide, liquid or solution, n.o.s.</i>		UN2892								
	1,4-Dinitro-1,1,4,4-tetramethyl- <i>olbutanetetranitrate (dry)</i>	Forbidden									
	2,4-Dinitro-1,3,5-trimethyl- <i>benzene</i>	Forbidden									
	1,3-Dinitro-4,5-dinitrosobenzene	Forbidden									
	1,3-Dinitro-5,5-dimethyl <i>hydantoin</i>	Forbidden									
	Dinitro-7,8-dimethylglycoluril <i>(dry)</i>	Forbidden									
E	Dinitrobenzene, solid, or Dinitrobenzol, solid <i>(RQ-1000/454)</i>	Poison B	UN1597	Poison	173.364	173.371	50 pounds	200 pounds	1,2	1,2	
E	Dinitrobenzene solution <i>(RQ-1000/454)</i>	Poison B	UN1597	Poison	173.345	173.346	1 quart	55 gallons	1,2	1,2	
	Dinitrochlorobenzene	Poison B	UN1577	Poison	173.364	173.365	50 pounds	200 pounds	1,2	1,2	
A	Dinitrocyclohexylphenol	ORM-A	NA9026	None	173.505	173.510	No limit	No limit			
	1,2-Dinitroethane	Forbidden									
	1,1-Dinitroethane <i>(dry)</i>	Forbidden									
	Dinitroglycoluril	Forbidden									
	Dinitromethane	Forbidden									
E	Dinitrophenol solution <i>(RQ-1000/454)</i>	Poison B	UN1599	Poison	173.345	173.362a	1 quart	65 pounds	1,2	1,2	70
	Dinitropropylene glycol	Forbidden									
	2,4-Dinitroresorcinol <i>(heavy metal salts of), (dry)</i>	Forbidden									
	4,6-Dinitroresorcinol <i>(heavy metal salts of), (dry)</i>	Forbidden									
	3,5-Dinitrosalicylic acid <i>(lead salt), (dry)</i>	Forbidden									
	Dinitrosobenzylamidine and salts <i>of (dry)</i>	Forbidden									
	2,2-Dinitrostilbene	Forbidden									
E	Dinitrotoluene, liquid <i>(RQ-1000/454)</i>	ORM-E	UN1600	None	None	173.510	No limit	No limit	1,2	1,2	
E	Dinitrotoluene, solid <i>(RQ-1000/454)</i>	ORM-E	UN2038	None	None	173.510	No limit	No limit	1,2	1,2	
	<i>α,α'-Di-(nitroxy) methylether</i>	Forbidden									
	1,9-Dinitroxy pentamethylene- 2,4,6,8-tetramine <i>(dry)</i>	Forbidden									
	Di-n-propyl peroxydicarbonate, <i>technically pure. See Organic peroxide, liquid, n.o.s.</i>		UN2176								
	Dioxane	Flammable liquid	UN1165	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	Dioxolane	Flammable liquid	UN1166	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	Diphenylaminechloroarsine <i>(DM)</i>	Irritating material	UN1698	Irritant	None	173.382	Forbidden	75 pounds	1	5	

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(1) +/ E/ A/ W/	(2) Hazardous materials descriptions and proper shipping names	(3) Hazard class	(3A) ID Number	(4) Label(s) required (if not excepted)	(5) Packaging		(6) Maximum net quantity in one package		(7) Water Shipments		
					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
	Diphenyl dichlorosilane	Corrosive material	UN1769	Corrosive	None	173.280	Forbidden	10 gallons	1	1	
	Diphenyl methyl bromide, solid	Corrosive material	UN1770	Corrosive	173.244	173.245b	25 pounds	100 pounds	1	4	
	Diphenyl methyl bromide solution	Corrosive material	UN1770	Corrosive	173.244	173.247	1 quart	1 gallon	1,2	1,2	
	<i>Diphosgene. See Phosgene</i>										
E	Diquat (RQ-1000/454)	ORM-E	NA2781	None	None	173.510	No limit	No limit	1,2	1,2	
	Di-sec-butyl peroxydicarbonate, technically pure. See Organic peroxide, liquid or solution, n.o.s.		UN2150								
	Di-sec-butyl peroxydicarbonate, not more than 52% in solution. See Organic peroxide, liquid or solution, n.o.s.		UN2151								
	Disinfectant, liquid	Corrosive material	UN1903	Corrosive	173.244	173.245	1 quart	10 gallons	1	4	
	Disinfectant, liquid	Poison B	UN1601	Poison	173.345	173.346	1 quart	55 gallons	1,2	1	
	Disinfectant, liquid, n.o.s.	Combustible liquid	NA1993	None	173.118a	None	No limit	No limit	1,2	1,2	
	Disinfectant, solid	Poison B	UN1601	Poison	173.364	173.365	50 pounds	200 pounds	1,2	1	
	Dispersant gas or Refrigerant gas. See 173.314 NOTE 13 and 173.15 NOTE 9										
	Distearyl peroxydicarbonate, not more than 85% with atearyl alcohol. See Organic peroxide, solid, n.o.s.		UN2592								
E	Disulfoton (RQ-1/0.454)	Poison B	NA2783	Poison	None	173.358	Forbidden	1 quart	1,2	5	
E	Disulfoton mixture, dry (RQ-1/0.454)	Poison B	NA2783	Poison	173.377	173.377	Forbidden	200 pounds	1,2	4	
E	Disulfoton mixture, liquid (RQ-1/0.454)	Poison B	NA2783	Poison	173.359	173.359	1/2 pint	1 quart	1,2	5	
	Di-tert-butyl peroxide, technically pure. See Organic peroxide, liquid or solution, n.o.s.		UN2102								
	1,1-Di-(tert-butylperoxy)-3,3,5-trimethyl cyclohexane, technically pure. See Organic peroxide, liquid or solution n.o.s.		UN2145								
	1,1-Di-(tert-butylperoxy)-3,3,5-trimethyl cyclohexane, not more than 57% in solution. See Organic peroxide, liquid or solution, n.o.s.		UN2146								
	1,1-Di-(tert-butylperoxy)-3,3,5-trimethyl cyclohexane, not more than 58% with inert solid. See Organic peroxide, solid, n.o.s.		UN2147								
	2,2-Di-(tert-butylperoxy) butane, not more than 55% in solution. See Organic peroxide, liquid or solution, n.o.s.		UN2111								

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(1) +/ E/ A/ W/	(2) Hazardous materials descriptions and proper shipping names	(3) Hazard class	(3A) ID Number	(4) Label(s) required (if not excepted)	(5) Packaging		(6) Maximum net quantity in one package		(7) Water Shipments		
					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
	2,2-Di-(tert-butylperoxy) butane, more than 55% in solution	Forbidden									
	1,1-Di-(tert-butylperoxy) cyclo- hexane, technically pure. See Organic peroxide, liquid or solution, n.o.s.		UN2179								
	1,1-Di-(tert-butylperoxy) cyclo- hexane, not more than 77% in solution. See Organic peroxide, liquid or solution, n.o.s.		UN2180								
	1,2-Di-(tert-butylperoxy) cyclo- hexane, not more than 77% in solution. See Organic peroxide, liquid or solution, n.o.s.		UN2181								
	1,1-Di-(tert-butylperoxy) cyclo- hexane, not more than 40% with inert inorganic solid, with not less than 13% phlegmatizer. See Organic peroxide, solid, n.o.s.		UN2885								
	1,1-Di-(tert-butylperoxy) cyclo- hexane, not more than 50% with phlegmatizer. See Organic peroxide, liquid or solution, n.o.s.		UN2897								
	Di-(tert-butylperoxy) phthalate, more than 55% in solution	Forbidden									
	Di-(tert-butylperoxy) phthalate, technically pure. See Organic peroxide, solid, n.o.s.		UN2106								
	Di-(tert-butylperoxy) phthalate, not more than 55% in solution. See Organic peroxide, liquid or solution, n.o.s.		UN2107								
	Di-(tert-butylperoxy) phthalate, not more than 55% as a paste. See Organic peroxide, solid, n.o.s.		UN2108								
	2,2-Di-(tert-butylperoxy) propane not more than 50% with phlegma- tizer. See Organic peroxide, liquid or solution, n.o.s.		UN2883								
	2,2-Di-(tert-butylperoxy) propane not more than 40% with inert inorganic solid with not less than 13% phlegmatizer. See Organic peroxide, solid, n.o.s.		UN2884								
	Dithiocarbamate pesticide, liquid, n.o.s. (compounds and preparations),	Flammable liquid	UN2772	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	Dithiocarbamate pesticide, liquid, n.o.s. (compounds and preparations),	Poison B	UN2771	Poison	173.345	173.346	1 quart	55 gallons	1,2	1,2	
	Dithiocarbamate pesticide, solid, n.o.s. (compounds and preparations),	Poison B	UN2771	Poison	173.364	173.365	50 pounds	200 pounds	1,2	1,2	
E	Diuron (RQ-100/45.4)	ORM-E	NA2767	None	None	173.510	No limit	No limit	1,2	1,2	
	Divinyl ether	Flammable liquid	UN1167	Flammable liquid	None	173.119	Forbidden	10 gallons	1,3	5	
E	Dodecylbenzenesulfonic acid (RQ-1000/454)	Corrosive material	NA2584	Corrosive	173.244	173.245	1 quart	10 gallons	1,2	1,2	

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(1) +/ E/ A/ W/	(2) Hazardous materials descriptions and proper shipping names	(3) Hazard class	(3A) ID Number	(4) Label(s) required (if not excepted)	(5) Packaging		(6) Maximum net quantity in one package		(7) Water Shipments		
					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
	Dodecyl trichlorosilane	Corrosive material	UN1771	Corrosive	None	173.280	Forbidden	10 gallons	1	1	13
	Dressing, leather	Combustible liquid	NA1142	None	173.118a	None	No limit	No limit	1,2	1,2	
	Dressing, leather	Flammable liquid	NA1142	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	<i>Drier. See Paint drier, liquid</i>										
	<i>Drill cartridge. See 173.65</i>										
	Drugs, n.o.s.	Combustible liquid	NA1993	None	173.118a	None	No limit	No limit	1,2	1,2	
	Drugs, n.o.s.	Flammable solid	NA1325	Flammable solid	173.153	173.154	25 pounds	100 pounds	1,2	1,2	
	Drugs, n.o.s.	Oxidizer	NA1479	Oxidizer	173.153	173.154	25 pounds	100 pounds	1,2	1,2	
	Drugs, n.o.s.	Flammable liquid	NA1993	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	Drugs, liquid, n.o.s.	Corrosive material	NA1760	Corrosive	173.244	173.245	1 quart	1 quart	1,2	1,2	
	Drugs, liquid, n.o.s.	Poison B	NA2810	Poison	173.345	173.346	1 quart	55 gallons	1,3	1	
	Drugs, solid, n.o.s.	Corrosive material	NA1759	Corrosive	173.244	173.245b	25 pounds	100 pounds	1,2	1,2	13
	Drugs, solid, n.o.s.	Poison B	NA2811	Poison	173.364	173.365	50 pounds	200 pounds	1,3	1,3	
	<i>Drums, empty, must be closed for the hazardous material previously contained in drum. See 173.29</i>										
	Dry ice. See Carbon dioxide, solid										
	Dye intermediate, liquid	Corrosive material	UN2801	Corrosive	173.244	173.249a	1 quart	10 gallons	1,2	1,2	39
	<i>Dynamite. See High explosive</i>										

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(1) +/ E/ A/ W/	(2) Hazardous materials descriptions and proper shipping names	(3) Hazard class	(3A) ID Number	(4) Label(s) required (if not excepted)	(5) Packaging		(6) Maximum net quantity in one package		(7) Water Shipments		
					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
E	EDTA. <i>See</i> Ethylenediaminetetra- acetic acid										
	Electric blasting caps. <i>See</i> Detonators, Class A or Class C explosives										
	Electric squib	Class C explosive		Explosive C	None	173.106	50 pounds	150 pounds	1,3	1,3	
	Electric storage battery, wet. <i>See</i> Battery, electric storage, wet										
	Electrolyte (acid) or alkaline battery fluid, packed with dry- storage battery	Corrosive material	NA2797	Corrosive	None	173.258	Forbidden	5 pints	1,2	1,2	
	Electrolyte (acid) or alkaline battery fluid, packed with battery charger, radio current supply device, or electronic equipment and actuating device.	Corrosive material	NA2797	Corrosive	None	173.259	Forbidden	5 pints	1,2	1,2	
E	Electrolyte (acid) battery fluid (not over 47% acid) RQ-1000/454	Corrosive material	UN2796	Corrosive	173.244	173.257	1 quart	5 gallons	1,2	1,2	7
	Empty cartridge bag with black powder igniter	Class C explosive		Explosive C	None	173.106	50 pounds	150 pounds	1,3	1,3	
	Enamel. <i>See</i> Paint, Enamel, Lacquer, etc.										
E	Endosulfan (RQ-1/0.454)	Poison B	NA2761	Poison	173.364	173.365	1 pound	10 pounds	1,2	1,2	45
E	Endosulfan mixture, liquid (RQ-1/0.454)	Poison B	NA2761	Poison	173.345	173.346	1 quart	55 gallons	1,2	1,2	
E	Endrin (RQ-1/0.454)	Poison B	NA2761	Poison	173.364	173.365	1 pound	10 pounds	1,2	1,2	45
E	Endrin mixture, liquid (RQ-1/0.454)	Poison B	NA2761	Poison	173.345	173.346	1 quart	55 gallons	1,2	1,2	
	Engine, internal combustion				173.120						
	Engine starting fluid	Flammable gas	UN1960	Flammable gas	None	173.304	Forbidden	60 pounds	1,2	5	
E	Epichlorohydrin (RQ-1000/454)	Flammable liquid	UN2023	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1,2	
	Eradicator, paint or grease, liquid	Flammable liquid	UN1850	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	Escape or Evacuation slide, inflatable. <i>See</i> Life rafts, inflatable										
E	Etching acid, liquid, n.o.s. (RQ-1000/454)	Corrosive material	NA1790	Corrosive	None	173.299	Forbidden	10 pounds	1	5	
+	Ethane	Flammable gas	UN1035	Flammable gas	173.306	173.304	Forbidden	300 pounds	1,2	4	
	Ethanol amine dinitrate	Forbidden									
E	Ethion (RQ-10/4.54)	Poison B	NA2783	Poison	173.345	173.346	Forbidden	1 quart	1,2	1,2	
E	Ethion mixture, dry (RQ-10/4.54)	Poison B	NA2783	Poison	173.364	173.365	50 pounds	200 pounds	1,2	1,2	
	Ethyl-3,3-di-(tert-butylperoxy) butyrate, technically pure. <i>See</i> Organic peroxide, liquid or solution, n.o.s.		UN2184								

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					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
	Ethyl-3,3-di-(tert-butylperoxy) butyrate, <i>not more than 77% in solution. See Organic peroxide, liquid or solution, n.o.s.</i>		UN2185								
	Ethyl-3,3-di-(tert-butylperoxy) butyrate, <i>not more than 50% with inert inorganic solid. See Organic peroxide, solid, n.o.s.</i>		UN2598								
	Ethyl acetate	Flammable liquid	UN1173	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	Ethyl acrylate, inhibited	Flammable liquid	UN1917	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	Ethyl alcohol	Flammable liquid	UN1170	Flammable liquid	173.118	173.125	1 quart	10 gallons	1,2	1	
E	Ethyl aldehyde. <i>See Acetaldehyde</i>										
	Ethyl benzene (RQ-1000/454)	Flammable liquid	UN1175	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	Ethyl borate	Flammable liquid	UN1176	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	13
	Ethyl butyl acerate	Combust- ible liquid	UN1177	None	173.118a	None	No limit	No limit	1,2	1,2	
	Ethyl butyl ether	Flammable liquid	UN1179	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	Ethyl butyraldehyde	Flammable liquid	UN1178	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	Ethyl butyrate	Flammable liquid	UN1180	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1,2	
	Ethyl chloride	Flammable liquid	UN1037	Flammable liquid	None	173.123	Forbidden	See 173.123	1,2	1	72
	Ethyl chloroacetate	Combust- ible liquid	UN1181	None	173.118a	None	No limit	No limit	1,2	1,2	
	Ethyl chloroformate (<i>chloro- carbonate</i>)	Flammable liquid	UN1182	Flammable liquid and Poison	None	173.288	Forbidden	5 pints	1,2	1	
	Ethyl chlorothioformate	Corrosive material	UN2826	Corrosive	173.244	173.245 173.245a	1 quart	1 quart	1,2	1	
	Ethyl crotonate	Flammable liquid	UN1862	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	Ethyl dichlorosilane	Flammable liquid	UN1183	Flammable liquid	None	173.135	Forbidden	5 pints	1,2	1	
+	Ethylene	Flammable gas	UN1962	Flammable gas	173.306	173.304	Forbidden	300 pounds	1,2	4	
	Ethylene chlorohydrin	Poison B	UN1135	Poison	173.345	173.346	1 quart	55 gallons	1,2	1	42
E	Ethylenediamine (RQ-1000/454)	Corrosive material	UN1604	Corrosive	173.244	173.245	1 quart	1 quart	1,2	1,2	
	Ethylene diamine diperchlorate	Forbidden									
E	Ethylenediaminetetraacetic acid (RQ-5000/2270)	ORM-E	NA9117	None	None	173.510	No limit	No limit	1,2	1,2	
EA	Ethylene dibromide (RQ-1000/454)	ORM-A	UN1605	None	173.505	173.620	1 quart	55 gallons	1,2	1,2	44
E	Ethylene dichloride (RQ-5000/2270)	Flammable liquid	UN1184	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	

ILLINOIS HAZARDOUS MATERIALS TRANSPORTATION REGULATIONS

§172.101 HAZARDOUS MATERIALS TABLE

(1) +/ E/ A/ W/	(2) Hazardous materials descriptions and proper shipping names	(3) Hazard class	(3A) ID Number	(4) Label(s) required (if not excepted)	(5) Packaging		(6) Maximum net quantity in one package		(7) Water Shipments		
					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
	Ethylene glycol diethyl ether (diethyl 'Cellosolve')	Combust- ible liquid	UN1153	None	173.118a	None	No limit	No limit	1,2	1,2	
	Ethylene glycol dinitrate	Forbidden									
	Ethylene glycol monoethyl ether ('Cellosolve')	Combust- ible liquid	UN1171	None	173.118a	None	No limit	No limit	1,2	1,2	
	Ethylene glycol monoethyl ether acetate ('Cellosolve acetate')	Combust- ible liquid	UN1172	None	173.118a	None	No limit	No limit	1,2	1,2	
	Ethylene glycol monomethyl ether (methyl 'Cellosolve')	Combust- ible liquid	UN1188	None	173.118a	None	No limit	No limit	1,2	1,2	
	Ethylene glycol monomethyl ether acetate (methyl 'Cellosolve acetate')	Combust- ible liquid	UN1189	None	173.118a	None	No limit	No limit	1,2	1,2	
	Ethylene imine, inhibited	Flammable liquid	UN1185	Flammable liquid and Poison	None	173.139	Forbidden	5 pints	1,2	1	
	Ethylene oxide	Flammable liquid	UN1040	Flammable liquid	None	173.124	Forbidden	See 173.124	1,2	1	72
	Ethyl ether	Flammable liquid	UN1155	Flammable liquid	None	173.119	Forbidden	10 gallons	1,3	5	
	Ethyl formate	Flammable liquid	UN1190	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,3	4	
	Ethylhexaldehyde	Combust- ible liquid	UN1191	None	173.118a	None	No limit	No limit	1,2	1,2	
	Ethyl hydroperoxide (explodes above 100 deg. C)	Forbidden									
	Ethyl lactate	Combust- ible liquid	UN1192	None	173.118a	None	No limit	No limit	1,2	1,2	
	Ethyl mercaptan	Flammable liquid	UN2363	Flammable liquid	None	173.141	Forbidden	10 gallons	1,2	1	
	Ethyl methyl ether	Flammable liquid	UN1039	Flammable liquid	None	173.119	Forbidden	10 gallons	1,3	1	72
	Ethyl methyl ketone	Flammable liquid	UN1193	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	Ethyl nitrate (nitric ether)	Flammable liquid	NA1993	Flammable liquid	173.118	173.119	Forbidden	Forbidden	1,2	1	
	Ethyl nitrite (nitrous ether)	Flammable liquid	UN1194	Flammable liquid	None	173.119	Forbidden	Forbidden	1,3	5	
	Ethyl perchlorate	Forbidden									
	Ethyl phenyl dichlorosilane	Corrosive material	UN2435	Corrosive	None	173.280	Forbidden	10 gallons	1	5	
	Ethyl phosphonothioic dichloride, anhydrous	Corrosive material	NA1760	Corrosive	173.244	173.245 173.245a	1 quart	1 quart	1	4	
	Ethyl phosphonous dichloride, anhydrous	Corrosive material	NA2845	Corrosive	173.244	173.245 173.245a	1 quart	1 quart	1	4	
	Ethyl phosphorodichloridate	Corrosive material	NA1760	Corrosive	173.244	173.245 173.245a	1 quart	1 quart	1	4	
	Ethyl propionate	Flammable liquid	UN1195	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	Ethyl silicate (tetraethyl orthosilicate)	Combust- ible liquid	UN1292	None	173.118a	None	No limit	No limit	1,2	1,2	

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§172.101 HAZARDOUS MATERIALS TABLE

(1) +/ E/ A/ W/	(2) Hazardous materials descriptions and proper shipping names	(3) Hazard class	(3A) ID Number	(4) Label(s) required (if not excepted)	(5) Packaging		(6) Maximum net quantity in one package		(7) Water Shipments		
					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
	Ethyl trichlorosilane	Flammable liquid	UN1196	Flammable liquid	None	173.135	Forbidden	5 pints	1,2	1	
	Etiologic agent, n.o.s.	Etiologic agent	NA2814	Etiologic agent	173.386	173.387	See 173.386	4 liters			73
W	Excelsior (shredded wood) when dry, clear, and free from oil	ORM-C		None	173.505	173.980			1,3	1,3	74
	Explosive auto alarm	Class C explosive		Explosive C	None	173.111	50 pounds	150 pounds	1,2	1,2	
	Explosive bomb	Class A explosive		Explosive A	None	173.56	Forbidden	Forbidden	1,2	5	75
	Explosive cable cutter	Class C explosive		Explosive C	None	173.102	50 pounds	150 pounds	1,3	1,3	
	Explosive, forbidden. See Sec. 173.51	Forbidden									
	Explosive mine	Class A explosive		Explosive A	None	173.56	Forbidden	Forbidden	1,2	5	75
	Explosive, new approval, and evaluation. See 173.86										
	Explosive power device, Class B	Class B explosive		Explosive B	None	173.94	Forbidden	150 pounds	1,2	5	
	Explosive power device, Class C	Class C explosive		Explosive C	None	173.102	50 pounds	150 pounds	1,3	1,3	
	Explosive projectile	Class A explosive		Explosive A	None	173.56	Forbidden	Forbidden	1,2	5	75
	Explosive release device	Class C explosive		Explosive C	None	173.102	50 pounds	150 pounds	1,3	1,3	
	Explosive rivet	Class C explosive		Explosive C	None	173.100	50 pounds	150 pounds	1,2	1,2	
	Explosive, sample for laboratory examination				173.86		Forbidden	See 173.86			
	Explosive torpedo	Class A explosive		Explosive A	None	173.56	Forbidden	Forbidden	1,2	5	75
	Extract, liquid, flavoring	Flammable liquid	UN1197	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	Fabric with animal or vegetable oil. See Fibers or fabric, containing not more than 5% animal or vegetable fat										
AW	Feed, wet, mixed	ORM-C		None	173.505	173.990	Forbidden	Forbidden	3	3	76
W	Felt, waste. See Cotton waste										
	Felt, waste, wet. See Waste wool, wet										
E	Ferric ammonium citrate (RQ-1000/454)	ORM-E	NA9118	None	None	173.510	No limit	No limit	1,2	1,2	
E	Ferric ammonium oxalate (RQ-1000/454)	ORM-E	NA9119	None	None	173.510	No limit	No limit	1,2	1,2	
	Ferric arsenate, solid	Poison B	UN1606	Poison	173.364	173.365	50 pounds	200 pounds	1,2	1,2	
	Ferric arsenite, solid	Poison B	UN1607	Poison	173.364	173.365	50 pounds	200 pounds	1,2	1,2	
EA	Ferric chloride, solid, anhydrous (RQ-1000/454)	ORM-B	UN1773	None	173.505	173.510	25 pounds	100 pounds	1,2	1,2	
E	Ferric chloride solution (RQ-1000/454)	Corrosive material	UN2582	Corrosive	173.244	173.245	1 quart	10 quarts	1,2	1,2	

ILLINOIS HAZARDOUS MATERIALS TRANSPORTATION REGULATIONS

§172.101 HAZARDOUS MATERIALS TABLE

(1) +/ E/ A/ W/	(2) Hazardous materials descriptions and proper shipping names	(3) Hazard class	(3A) ID Number	(4) Label(s) required (if not excepted)	(5) Packaging		(6) Maximum net quantity in one package		(7) Water Shipments		
					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
E	Ferric fluoride (RQ-100/45.4)	ORM-E	NA9120	None	None	173.510	No limit	No limit	1,2	1,2	
E	Ferric nitrate (RQ-1000/454)	Oxidizer	UN1466	Oxidizer	173.153	173.182	25 pounds	100 pounds	1,2	1,2	
E	Ferric sulfate (RQ-1000/454)	ORM-E	NA9121	None	None	173.510	No limit	No limit	1,2	1,2	
W	Ferrochrome, exothermic	ORM-C		None	173.505	173.985			1	1	
W	Ferromanganese, exothermic. See Ferrochrome, exothermic										
W	Ferrophosphorus	ORM-A		None	173.505	173.635			1,2	1,2	77
AW	Ferrosilicon, containing 30% or more but not more than 70% silicon	ORM-A	UN1408	None	173.505	173.645	Forbidden	25 pounds	1,2	1,2	78
E	Ferrous ammonium sulfate (RQ-1000/454)	ORM-E	NA9122	None	None	173.510	No limit	No limit	1,2	1,2	
	Ferrous arsenate, solid	Poison B	UN1608	Poison	173.364	173.365	50 pounds	200 pounds	1,2	1,2	
EA	Ferrous chloride, solid (RQ-100/45.4)	ORM-B	NA1759	None	173.505	173.510	No limit	No limit	1,2	1,2	
E	Ferrous chloride, solution (RQ-100/45.4)	Corrosive material	NA1760	Corrosive	173.244	173.245	1 quart	5 gallons	1,2	1,2	
E	Ferrous sulfate (RQ-1000/454)	ORM-E	NA9125	None	None	173.510	No limit	No limit	1,2	1,2	
	Fertilizer ammoniating solution containing free ammonia (more than 25.3 p.s.i.g.)	Non- flammable gas	UN1043	Non- flammable gas	173.306	173.304 173.314	Forbidden	300 pounds	1,2	4	
	Fertilizer, tankage. See Garbage, tankage										
	Fibers or fabric, containing not more than 5% animal or vegetable oil	Flammable solid	NA1373	Flammable solid	None	173.170	Forbidden	Forbidden	1,2	1,2	29
W	Fibers (jute, hemp, flax, sisal, coir, kapok, and similar vege- table fibers)	ORM-C	NA1372	None	173.505	173.965			1,2	1,2	79
	Fibers, burnt	Flammable solid	NA1372	Flammable solid	None	173.169	Forbidden	Forbidden	1,2	1,2	29
	Film (nitrocellulose)	Flammable solid	NA1324	Flammable solid	None	173.177	50 pounds	200 pounds	1,3	1,3	80
	Film, photographic, (including scrap film), safety, nonflam- mable, or slow burning. Not sub- ject to requirements of this sub- chapter										
	Firecracker. See Fireworks, common or special										
	Firecracker salute. See Fire- works, common or special										
	Fire extinguisher	Non- flammable gas	UN1044	Non- flammable gas	173.306		150 pounds	300 pounds	1,2	1,2	
	Fire extinguisher charge contain- ing not more than 50 grains of propellant explosive per unit. Not subject to requirements of this subchapter.										
	Fire extinguisher charge contain- ing sulfuric acid	Corrosive material	UN1774	Corrosive	173.261		1 quart	1 gallon	1,2	1,2	
	Fireworks, common	Glass C explosive		Explosive C	None	173.100 173.108	50 pounds	200 pounds	1,3	1,3	81

ILLINOIS HAZARDOUS MATERIALS TRANSPORTATION REGULATIONS

§172.101 HAZARDOUS MATERIALS TABLE

(1) +/ E/ A/ W/	(2) Hazardous materials descriptions and proper shipping names	(3) Hazard class	(3A) ID Number	(4) Label(s) required (if not excepted)	(5) Packaging		(6) Maximum net quantity in one package		(7) Water Shipments		
					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
	<i>Fireworks, exhibition display piece. See Fireworks, special</i>										
	Fireworks, special	Class B explosive		Explosive B	None	173.88 173.91	Forbidden	200 pounds	3	3	82
W	Fish meal or fish scrap contain- ing 6% to 12% water	ORM-C	NA2216	None	173.505	173.995			1,2	1,2	83
	Fish meal or fish scrap contain- ing less than 6% or more than 12% water.	Flammable solid	NA1374	Flammable solid	None	173.171	Forbidden	Forbidden	1,2	1,2	29
	Fissile radioactive material. <i>See</i> Radioactive material, fissile										
	Flame retardant compound liquid	Corrosive material	NA1760	Corrosive	173.244	173.291	1 quart	10 gallons	1,2	1,2	
+	Flammable gas n.o.s. <i>See</i> Compressed gas, n.o.s.										
	Flammable liquid, corrosive, n.o.s.	Flammable liquid	UN2924	Flammable liquid and Corrosive	173.118	173.119	1 quart	1 quart	1,2	1	
	Flammable liquid, n.o.s.	Flammable liquid	UN1993	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	Flammable liquid, poisonous, n.o.s.	Flammable liquid	UN1992	Flammable liquid and Poison	173.118	173.119	1 quart	10 gallons	1,2	1	
	Flammable solid, corrosive, n.o.s.	Flammable solid	UN2925	Flammable solid and Corrosive	173.153	173.154	25 pounds	25 pounds	1	4	
	Flammable solid, n.o.s.	Flammable solid	UN1325	Flammable solid	173.153	173.154	25 pounds	25 pounds	1,2	1,2	
	Flammable solid, poisonous, n.o.s.	Flammable solid	UN2926	Flammable solid and Poison	173.153	173.154	25 pounds	25 pounds	1,2	1	
	<i>Flare. See Fireworks, common</i>										
	<i>Flare, airplane. See Fireworks, special</i>										
	<i>Flash cartridge. See Fireworks, special or Low explosives</i>										
	<i>Flash cracker. See Fireworks, common or special</i>										
	<i>Flash powder. See Fireworks, special or Low explosives</i>										
	<i>Flax. See Fibers</i>										
	Flexible linear shaped charge, metal clad	Class C explosive		Explosive C	None	173.104	50 pounds	300 pounds	1,3	1,3	
	Flowers of sulfur. <i>See</i> Sulfur										
	Flue dust, poisonous	Poison B	NA2811	Poison	173.364	173.368	50 pounds	200 pounds	1,2	1,2	
	Fluoboric acid	Corrosive material	UN1775	Corrosive	173.244	173.283	1 quart	1 gallon	1,2	1,2	
E	Fluoric acid. <i>See</i> Hydrofluoric acid										
	Fluorine	Non- flammable gas	UN1045	Poison and Oxidizer	None	173.302	Forbidden	Forbidden	1	5	59

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§172.101 HAZARDOUS MATERIALS TABLE

(1) +/ E/ A/ W/	(2) Hazardous materials descriptions and proper shipping names	(3) Hazard class	(3A) ID Number	(4) Label(s) required (if not excepted)	(5) Packaging		(6) Maximum net quantity in one package		(7) Water Shipments		
					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
	Fluorophosphoric acid, anhydrous. <i>See</i> Monofluorophosphoric acid, anhydrous										
	Fluorosilicic acid. <i>See</i> Hydro- fluorosilicic acid										
	Fluorosulfonic acid <i>or</i> Fluosulfonic acid	Corrosive material	UN1777	Corrosive	None	173.274	Forbidden	1 gallon	1	5	13
	<i>Forbidden explosives. See</i> 173.51	Forbidden									
	<i>Forbidden materials. See</i> 173.21	Forbidden									
EA	Formaldehyde solution (<i>flash</i> point not more than 141 deg F.; in containers of 110 gallons or less) (RQ-1000/454)	ORM-A	UN2209	None	173.505	173.510	10 gallons	55 gallons	1,2	4	
E	Formaldehyde solution (<i>flash</i> point not more than 141 deg F.; in containers over 110 gallons) (RQ-1000/454)	Combust- ible liquid	UN1198	None	173.118a	None	10 gallons	55 gallons	1,2	1,2	
EA	Formaldehyde solution (<i>flash</i> point not more than 141 deg F.; in containers of 110 gallons or less) (RQ-1000/454)	ORM-A	UN1198	None	173.505	173.510	10 gallons	55 gallons	1,2	4	
E	Formaldehyde solution (<i>flash</i> point not more than 141 deg F.; in containers over 110 gallons) (RQ-1000/454)	Combust- ible liquid	UN2209	None	173.118a	None	10 gallons	55 gallons	1,2	1,2	
	Formalin. <i>See</i> Formaldehyde solution										
E	Formic acid (RQ-5000/2270)	Corrosive material	UN1779	Corrosive	173.244	173.245 173.289	1 quart	5 gallons	1,2	1,2	7
E	Formic acid solution (RQ-5000/2270)	Corrosive material	UN1779	Corrosive	173.244	173.245 173.289	1 quart	5 gallons	1,2	1,2	
	Fuel, aviation, turbine engine	Flammable liquid	UN1863	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	Fuel, aviation, turbine engine	Combust- ible liquid	UN1863	None	173.118a	None	No limit	No limit	1,2	1,2	
	Fuel oil	Combust- ible liquid	NA1993	None	173.118a	None	No limit	No limit	1,2	1,2	
	Fuel oil, diesel. <i>See</i> Fuel oil										
	Fuel oil, No. 1,2,4,5 <i>or</i> 6	Combust- ible liquid	NA1993	None	173.118a	None	No limit	No limit	1,2	1,2	
	Fulminate of mercury (dry)	Forbidden									
	Fulminate of mercury, wet. <i>See</i> Initiating explosive										
	Fulminating gold	Forbidden									
	Fulminating mercury	Forbidden									
	Fulminating platinum	Forbidden									
	Fulminating silver	Forbidden									
	Fulminic acid	Forbidden									
E	Fumaric acid (RQ-5000/2270)	ORM-E	NA9126	None	None	173.510	No limit	No limit	1,2	1,2	

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(1) +/ E/ A/ W/	(2) Hazardous materials descriptions and proper shipping names	(3) Hazard class	(3A) ID Number	(4) Label(s) required (if not excepted)	(5) Packaging		(6) Maximum net quantity in one package		(7) Water Shipments		
					(a)	(b)	(a)	(b)	(a)	(b)	(c)
					Excep- tions	Specific require- ments	Passenger carrying aircraft or railcar	Cargo only aircraft	Cargo vessel	Pas- senger vessel	Other require- ments See Sec. 172.101(i)
	Phosgene	Corrosive material	UN1780	Corrosive	173.244	173.245	1 quart	1 quart	1	1	84
	<i>Fumigant. See 173.152(a) Note 1</i>										
	Furan	Flammable liquid	UN2389	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
E	Furfural (RQ-1000/454)	Combustible liquid	UN1199	None	173.118a	None	No limit	No limit	1,2	1	
	Fusee (railway or highway)	Flammable solid	NA1325	Flammable solid	None	173.154a	50 pounds	200 pounds	1,3	1,3	
	Fuse igniter	Class C explosive		Explosive C	None	173.106	50 pounds	150 pounds	1,3	1,3	
	Fuse, instantaneous	Class C explosive		Explosive C	173.100		50 pounds	150 pounds	1,2	1,2	
	Fuse lighter	Class C explosive		Explosive C	None	173.106	50 pounds	150 pounds	1,3	1,3	
	Fusel oil	Combustible liquid	UN1201	None	173.118a	None	No limit	No limit	1,2	1,2	
	Fuse, mild detonating, metal clad	Class C explosive		Explosive C	None	173.104	50 pounds	300 pounds	1,2	1,2	
	Fuse, safety	Class C explosive		Explosive C	173.100	173.100	50 pounds	300 pounds	1,2	1,2	
	Fuze, combination	Class C explosive		Explosive C	None	173.105	50 pounds	150 pounds	1,3	1,3	
	Fuze, detonating	Class A explosive		Explosive A	None	173.69	Forbidden	Forbidden	6	5	
	Fuze, detonating, Class C explosive	Class C explosive		Explosive C	None	173.113	50 pounds	150 pounds	1,3	1,3	
	Fuze, detonating, radioactive	Class A explosive		Explosive A	None	173.69	Forbidden	Forbidden	6	5	
	Fuze, percussion	Class C explosive		Explosive C	None	173.105	50 pounds	150 pounds	1,3	1,3	
	Fuze, time	Class C explosive		Explosive C	None	173.105	50 pounds	150 pounds	1,3	1,3	
	Fuze, tracer	Class C explosive		Explosive C	None	173.105	50 pounds	150 pounds	1,3	1,3	

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§172.101 HAZARDOUS MATERIALS TABLE

(1) +/ E/ A/ W/	(2) Hazardous materials descriptions and proper shipping names	(3) Hazard class	(3A) ID Number	(4) Label(s) required (if not excepted)	(5) Packaging		(6) Maximum net quantity in one package		(7) Water Shipments		
					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
	<i>Galactean trinitrate</i>	Forbidden									
	Gallium metal, liquid	ORM-B	UN2803	None	None	173.861	Forbidden	Forbidden	1	5	85
	Gallium metal, solid	ORM-B	UN2803	None	None	173.862	40 pounds	40 pounds	1,3	1	4
W	Garbage tankage containing 8% or more water	ORM-C		None	173.505	173.1000			1,2	1,2	
	Garbage tankage, containing less than 8% water	Flammable solid	NA1325	Flammable solid	None	173.209	Forbidden	Forbidden	1	1	29
	Gas Cylinder, empty. See Cylinder, empty										
	Gas drips, hydrocarbon	Combust- ible liquid	UN1864	None	173.118a	None	No limit	No limit	1,2	1,2	
	Gas drips, hydrocarbon	Flammable liquid	UN1864	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	Gas identification set	Poison A	NA9035	Poison gas	None	173.331	Forbidden	Forbidden	1	5	
	Gas identification set	Irritating material	NA9035	Irritant	None	173.331	Forbidden	Forbidden	1	5	
	<i>Gas mine. See Explosive mine</i>										
	<i>Gasohol (gasoline mixed with ethyl alcohol). See Gasoline</i>										
	<i>Gas oil. See Fuel oil</i>										
	Gasoline (including casing- head and natural)	Flammable liquid	UN1203	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	4	
	<i>Gelatine Dynamite. See High explosive</i>										
	Germane	Poison A	UN2192	Poison gas and Flammable gas	None	173.332	Forbidden	Forbidden	1	5	72
	<i>Glycerol-1,3-dinitrate</i>	Forbidden									
	<i>Glycerol monogluconate trini- trate</i>	Forbidden									
	<i>Glycerol monolactate trinitrate</i>	Forbidden									
	Grenade without bursting charge. (With incendiary material)	Class B explosive		Explosive B	None	173.91	Forbidden	Forbidden	3	3	81
	Grenade without bursting charge. (With smoke charge) (Smoke grenade)	Class C explosive		Explosive C	None	173.108	50 pounds	150 pounds	1,3	1,3	
	Grenade without bursting charge. (With Poison A gas charge)	Poison A	NA2016	Poison gas	None	173.330	Forbidden	Forbidden			58
	Grenade without bursting charge. (With Poison B charge)	Poison B	NA2016	Poison	None	173.350	Forbidden	Forbidden			56
	Grenade, empty, primed	Class C explosive		None	None	173.107	50 pounds	150 pounds	1,3	1,3	
	Grenade, hand or rifle, explo- sive (with or without gas, smoke, or incendiary material)	Class A Explosive		Explosive A	None	173.56	Forbidden	Forbidden	1,2	5	25
	Grenade, tear gas	Irritating material	NA2017	Irritant	None	173.385	Forbidden	75 pounds	1,2	1	
	Guanidine nitrate	Oxidizer	UN1467	Oxidizer	173.153	173.182	25 pounds	100 pounds	1,2	1,2	86

ILLINOIS HAZARDOUS MATERIALS TRANSPORTATION REGULATIONS

§172.101 HAZARDOUS MATERIALS TABLE

(1) +/E/A/W	(2) Hazardous materials descriptions and proper shipping names	(3) Hazard class	(3A) ID Number	(4) Label(s) required (if not excepted)	(5) Packaging		(6) Maximum net quantity in one package		(7) Water Shipments		
					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
	Guanyl nitroamino guanylidene hydrazine. See Initiating explosive										
	Guanyl nitroamino guanylidene hydrazine (dry)	Forbidden									
	Guanyl nitroamino guanyl tetraazene. See Initiating explosive										
	Guided missile, without warhead. See Rocket motor, Class A explosive or Rocket motor, Class B explosive										
	Guided missile with warhead. See Rocket ammunition with explosive, illuminating, gas, incendiary, or smoke projectile										
	Guncotton. See High explosive										
E	Guthion. See Azinphos methyl										
E	Guthion mixture, liquid. See Azinphos methyl mixture, liquid										
	Hafnium metal, dry. (See 173.214 Note 3)	Flammable solid	UN2545	Flammable solid	None	173.214	Forbidden	75 pounds	1	5	
	Hafnium metal, wet	Flammable solid	UN1326	Flammable solid	None	173.214	Forbidden	150 pounds	1,2	5	
	Hair, wet	Flammable solid	NA1372	Flammable solid	None	173.172	Forbidden	Forbidden	1,2	5	29
	Hand signal device	Class C explosive		Explosive C	None	173.108	50 pounds	200 pounds	1,2	1,2	
W	Hay	ORM-C	UN1327	None	173.505	173.1005			1,2	1,2	79
W	Hay or straw (loose, wet, or damp)		UN1327								87
E	Hazardous substance, liquid or solid, n.o.s.	ORM-E	NA9188	None	None	173.1300	No limit	No limit	1,2	1,2	
E	Hazardous waste, liquid or solid, n.o.s.	ORM-E	NA9189	None	None	173.1300	Forbidden	550 pounds	1,2	1,2	
	Hazardous waste, meeting the definition of a hazard class other than ORM-E. See 172.101 (a)(10)										
	Heater for refrigerator car, liquid fuel type (containing fuel)	Flammable liquid	NA1993	Flammable liquid	173.146		Forbidden	Forbidden	1,2	1	
	Helium	Non-flammable gas	UN1046	Non-flammable gas	173.306	173.302 173.314	150 pounds	300 pounds	1,2	1,2	
	Helium-oxygen mixture	Non-flammable gas	NA1980	Non-flammable gas	173.306	173.302	150 pounds	300 pounds	1,2	1,2	
E	Heptachlor (RQ-1/0.454)	ORM-E	NA2761	None	None	173.510	No limit	No limit	1,2	1,2	45
	Heptane	Flammable liquid	UN1206	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
W	Hessian. See Burlap cloth										
E	Hexachlorocyclopentadiene (RQ-1/0.454)	Corrosive material	UN2646	Corrosive	173.244	173.245	1 quart	10 gallons	1,2	1,2	
W	Hexachloroethane	ORM-A	NA9037	None	173.505	173.650			1,2	1,2	

ILLINOIS HAZARDOUS MATERIALS TRANSPORTATION REGULATIONS

§172.101 HAZARDOUS MATERIALS TABLE

(1) +/ E/ A/ W/	(2) Hazardous materials descriptions and proper shipping names	(3) Hazard class	(3A) ID Number	(4) Label(s) required (if not excepted)	(5) Packaging		(6) Maximum net quantity in one package		(7) Water Shipments		
					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
	Hexadecyltrichlorosilane	Corrosive material	UN1781	Corrosive	None	173.280	Forbidden	10 gallons	1	1	13
	Hexadiene	Flammable liquid	UN2458	Flammable liquid	None	173.119	Forbidden	10 gallons	1,2	5	
	Hexaethyl tetraphosphate and compressed gas mixture	Poison A	UN1612	Poison gas	None	173.334	Forbidden	Forbidden	1	5	4
	Hexaethyl tetraphosphate, liquid	Poison B	UN1611	Poison	None	173.358	Forbidden	1 quart	1	4	
	Hexaethyl tetraphosphate mixture, dry (containing more than 2% hexaethyl tetraphosphate)	Poison B	NA2783	Poison	None	173.377	Forbidden	200 pounds	1,2	5	
	Hexaethyl tetraphosphate mixture, dry (containing not more than 2% hexaethyl tetraphosphate)	Poison B	NA2783	Poison	173.377	173.377	50 pounds	200 pounds	1,2	4	
	Hexaethyl tetraphosphate mixture, liquid (containing more than 25% hexaethyl tetraphosphate)	Poison B	NA2783	Poison	None	173.359	Forbidden	1 quart	1,2	5	
	Hexaethyl tetraphosphate mixture, liquid (containing not more than 25% hexaethyl tetraphosphate)	Poison B	UN2783	Poison	173.359	173.359	1 quart	1 quart	1,2	4	
	Hexafluorophosphoric acid	Corrosive material	UN1782	Corrosive	None	173.275	Forbidden	1 gallon	1,2	1,2	
	Hexafluoropropylene	Non-flammable gas	UN1858	Non-flammable gas	173.306	173.304 173.314 173.315	150 pounds	300 pounds	1	4	
	Hexafluoropropylene oxide	Non-flammable gas	NA1956	Non-flammable gas	173.306	173.304 173.314	150 pounds	300 pounds	1,2	1,2	
	Hexaldehyde	Flammable liquid	UN1207	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1,2	
	3,3,6,6,9,9-Hexamethyl-1,2,4,5-tetraoxocyclononane, technically pure. See Organic peroxide, solid, n.o.s.		UN2165								
	3,3,6,6,9,9-Hexamethyl-1,2,4,5-tetraoxocyclononane, not more than 52% with inert solid. See Organic peroxide, solid, n.o.s.		UN2166								
	3,3,6,6,9,9-Hexamethyl-1,2,4,5-tetraoxocyclononane, not more than 52% in solution. See Organic peroxide, liquid or solution, n.o.s.		UN2167								
	Hexamethylenediamine, solid	Corrosive material	UN2280	Corrosive	173.244	173.245b	25 pounds	100 pounds	1,2	1,2	
	Hexamethylenediamine, solution	Corrosive material	UN1783	Corrosive	173.244	173.292	1 quart	10 gallons	1,2	1,2	
	Hexamethyleneimine	Corrosive material	UN2493	Corrosive	173.244	173.245	1 quart	10 gallons	1,2	1,2	
	Hexamethylene triperoxide diamine (dry)	Forbidden									
	Hexamethylol benzene hexanitrate	Forbidden									
	Hexane	Flammable liquid	UN1208	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,3	4	
	2,2',4,4',6,6'-Hexanitro-3,3'-dihydroxyazobenzene (dry)	Forbidden									

ILLINOIS HAZARDOUS MATERIALS TRANSPORTATION REGULATIONS

§172.101 HAZARDOUS MATERIALS TABLE

(1) +/ E/ A/ W/	(2) Hazardous materials descriptions and proper shipping names	(3) Hazard class	(3A) ID Number	(4) Label(s) required (if not excepted)	(5) Packaging		(6) Maximum net quantity in one package		(7) Water Shipments		
					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
	Hexanitroazoxy benzene	Forbidden									
	2,2',3',4,4',6-Hexanitrodi- phenylamine	Forbidden									
	2,3',4,4',6,6'-Hexanitrodi- phenylether	Forbidden									
	N,N'-(hexanitrodiphenyl)ethylene dinitramine (dry)	Forbidden									
	Hexanitrodiphenyl urea	Forbidden									
	Hexanitroethane	Forbidden									
	Hexanitrooxanilide	Forbidden									
	Hexanoic acid	Corrosive material	NA1760	Corrosive	173.244	173.245	1 quart	10 gallons	1,2	1,2	
	Hexyltrichlorosilane	Corrosive material	UN1784	Corrosive	None	173.280	Forbidden	10 gallons	1	1	13
	High explosive	Class A explosive		Explosive A	173.65	173.61 to 173.87	Forbidden	Forbidden	6	5	
	High explosive, liquid	Class A explosive		Explosive A	None	173.62	Forbidden	Forbidden	6	5	
	Hydraulic accumulator. See Accumulator, pressurized										
	Hydrazine, anhydrous	Flammable liquid	UN2029	Flammable liquid and Poison	None	173.276	Forbidden	5 pints	1	5	88
	Hydrazine, aqueous solution	Corrosive material	UN2030	Corrosive	None	173.276	Forbidden	5 pints	1	5	
	Hydrazine azide	Forbidden									
	Hydrazine chlorate	Forbidden									
	Hydrazine dicarbonic acid diazide	Forbidden									
	Hydrazine perchlorate	Forbidden									
	Hydrazine selenate	Forbidden									
	Hydriodic acid	Corrosive material	UN1787	Corrosive	173.244	173.245	1 quart	1 gallon	1	1	89
	Hydrobromic acid, more than 49% strength	Corrosive material	UN1788	Corrosive	None	173.262	Forbidden	Forbidden	1	1	89
	Hydrobromic acid, anhydrous. See Hydrogen bromide										
	Hydrobromic acid not more than 49% strength	Corrosive material	UN1788	Corrosive	173.244	173.262	1 quart	1 gallon	1	1	89
+	Hydrocarbon gas, liquefied	Flammable gas	UN1965	Flammable gas	173.306	173.304 173.314	Forbidden	300 pounds	1,2	1	
+	Hydrocarbon gas, nonliquefied	Flammable gas	UN1964	Flammable gas	173.306	173.302	Forbidden	300 pounds	1,2	1	
E	Hydrochloric acid (RQ-5000/2270)	Corrosive material	UN1789	Corrosive	173.244	173.263	1 quart	1 gallon	1	1	89
E	Hydrochloric acid, anhydrous. See Hydrogen chloride										
E	Hydrochloric acid mixture (RQ-5000/2270)	Corrosive material	NA1789	Corrosive	173.244	173.263	1 quart	1 gallon	1	1	89
E	Hydrochloric acid solution, inhibited (RQ-5000/2270)	Corrosive material	UN1789	Corrosive	173.244	173.263	1 quart	1 gallon	1	1	89

ILLINOIS HAZARDOUS MATERIALS TRANSPORTATION REGULATIONS

§172.101 HAZARDOUS MATERIALS TABLE

(1) +/ E/ A/ W/	(2) Hazardous materials descriptions and proper shipping names	(3) Hazard class	(3A) ID Number	(4) Label(s) required (if not excepted)	(5) Packaging		(6) Maximum net quantity in one package		(7) Water Shipments		
					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
E	Hydrocyanic acid (<i>prussic</i>) solu- tion (5% or more hydrocyanic acid) (RQ-10/4.54)	Poison A	UN1613	Poison gas and Flam- mable gas	None	173.332	Forbidden	Forbidden	1	5	90, 72
E	Hydrocyanic acid, liquefied (RQ-10/4.54)	Poison A	NA1051	Poison gas and Flam- mable gas	None	173.332	Forbidden	Forbidden	1	5	72
	<i>Hydrocyanic acid (prussic), unstabilized</i>	Forbidden									
+E	Hydrocyanic acid solution, less than 5% hydrocyanic acid (RQ-10/4.54)	Poison B	UN1613	Poison	None	173.351	Forbidden	25 pounds	1	5	4
E	Hydrofluoric acid, anhydrous. <i>See</i> Hydrogen fluoride										
E	Hydrofluoric acid solution (RQ-5000/2270)	Corrosive material	UN1790	Corrosive	173.244	173.264	1 quart	1 gallon	1	4	
E	Hydrofluoric and sulfuric acid mixture (RQ-5000/2270)	Corrosive material	UN1786	Corrosive	None	173.290	Forbidden	1 gallon	1	5	
	<i>Hydrofluoroboric acid. See Fluoboric acid</i>										
	<i>Hydrofluosilicic acid</i>	Corrosive material	NA1778	Corrosive	None	173.265	1 quart	1 gallon	1,2	1,2	
+	Hydrogen	Flammable gas	UN1049	Flammable gas	173.306	173.302 173.314	Forbidden	300 pounds	1,2	5,4	
	Hydrogen bromide	Non- flammable gas	UN1048	Non- flammable gas	173.306	173.304	Forbidden	300 pounds	1	4	
E	Hydrogen chloride (RQ-5000/2270)	Non- flammable gas	UN1050	Non- flammable gas	173.306	173.304	Forbidden	300 pounds	1	4	
E	Hydrogen fluoride (RQ-5000/2270)	Corrosive material	UN1791	Corrosive	None	173.264	Forbidden	110 pounds	1	5	91
	<i>Hydrogen iodide solution. See Hydriodic acid</i>										
+	Hydrogen, liquefied	Flammable gas	UN1966	Flammable gas	None	173.316	Forbidden	Forbidden			55
	Hydrogen peroxide solution (40% to 52% peroxide)	Oxidizer	UN2014	Oxidizer	173.244	173.266	Forbidden	Forbidden	1	4	92
	Hydrogen peroxide solution (8% to 40% peroxide)	Oxidizer	UN2014	Oxidizer	173.244	173.266	1 quart	1 gallon	1,2	1	92
	Hydrogen peroxide solution (over 52% peroxide)	Oxidizer	UN2015	Oxidizer and Corrosive	None	173.266	Forbidden	Forbidden	1	5	93
+	Hydrogen selenide	Flammable gas	UN2202	Flammable gas and Poison	None	173.328	Forbidden	Forbidden	1	5	
E	Hydrogen sulfate. <i>See</i> Sulfuric acid										
+E	Hydrogen sulfide (RQ-100/45.4)	Flammable gas	UN1053	Flammable gas and Poison	None	173.304 173.314	Forbidden	300 pounds	1	5	
	<i>Hydrosilicofluoric acid. See Hydrofluorosilicic acid</i>										
	<i>Hydroxyl amine iodide</i>	Forbidden									
E	Hypochlorite solution contain- ing more than 7% available chlorine by weight (RQ-100/45.4)	Corrosive material	NA1791	Corrosive	173.244	173.277	1 quart	4 gallons	1,2	1	7

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§172.101 HAZARDOUS MATERIALS TABLE

(1) +/E/A/W/	(2) Hazardous materials descriptions and proper shipping names	(3) Hazard class	(3A) ID Number	(4) Label(s) required (if not excepted)	(5) Packaging		(6) Maximum net quantity in one package		(7) Water Shipments		
					(a) Excep-tions	(b) Specific require-ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas-senger vessel	(c) Other require-ments See Sec. 172.101(i)
EA	Hypochlorite solution containing not more than 7% available chlorine by weight (RQ-100/45.4)	ORM-B	NA1791	None	173.505	173.510	No limit	No limit			
	<i>Hyponitrous acid</i>	Forbidden									
	Igniter	Class C explosive		Explosive C	None	173.106	50 pounds	150 pounds	1,3	1,3	
	Igniter cord	Class C explosive		Explosive C	None	173.100	50 pounds	150 pounds	1,3	1,3	
	Igniter fuse, metal clad	Class C explosive		Explosive C	None	173.106	50 pounds	150 pounds	1,3	1,3	
	Igniter, jet thrust (jato)	Class A explosive		Explosive A	None	173.79	Forbidden	Forbidden	6	5	
	Igniter, jet thrust (jato)	Class B explosive		Explosive B	None	173.92	Forbidden	550 pounds	1,3	5	
	Igniter, rocket motor	Class A explosive		Explosive A	None	173.79	Forbidden	Forbidden	6	5	
	Igniter, rocket motor	Class B explosive		Explosive B	None	173.92	Forbidden	550 pounds	1,3	5	
	<i>Illuminating projectile. See Fireworks, special</i>										
	Iminobispropylamine	Corrosive material	UN2269	Corrosive	173.244	173.245	1 quart	10 gallons	1,2	1,2	
	Initiating explosive (diazodinitrophenol)	Class A explosive		Explosive A	None	173.70	Forbidden	Forbidden	6	5	
	Initiating explosive (fulminate of mercury)	Class A explosive		Explosive A	None	173.71	Forbidden	Forbidden	6	5	
	Initiating explosive (guanyl nitrosamino guanylidene hydrazine)	Class A explosive		Explosive A	None	173.72	Forbidden	Forbidden	6	5	
	Initiating explosive (lead azide, detonated type only)	Class A explosive		Explosive A	None	173.73	Forbidden	Forbidden	6	5	
	Initiating explosive (lead mononitroresorcinate)	Class A explosive		Explosive A	None	173.70	Forbidden	Forbidden	6	5	
	Initiating explosive (lead styphnate (lead trinitroresorcinate))	Class A explosive		Explosive A	None	173.74	Forbidden	Forbidden	6	5	
	Initiating explosive (nitro mannite)	Class A explosive		Explosive A	None	173.75	Forbidden	Forbidden	6	5	
	Initiating explosive (nitro-soguanidine)	Class A explosive		Explosive A	None	173.76	Forbidden	Forbidden	6	5	
	Initiating explosive (pentarythrite tetranitrate)	Class A explosive		Explosive A	None	173.77	Forbidden	Forbidden	6	5	
	Initiating explosive (tetrazene (guanyl nitrosamino guanyl tetrazene))	Class A explosive		Explosive A	None	173.78	Forbidden	Forbidden	6	5	
	<i>Initiating explosives (dry)</i>	Forbidden									
	Ink	Combustible liquid	UN2867	None	173.118a	None	No limit	No limit	1,2	1,2	
	Ink	Flammable liquid	UN1210	Flammable liquid	173.118	173.144	1 quart	10 gallons	1,2	1	
	<i>Inositol hexanitrate (dry)</i>	Forbidden									
	Insecticide, dry, n.o.s.	Poison B	NA2588	Poison	173.364	173.365	50 pounds	200 pounds	1,2	1,2	

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(1) +/ E/ A/ W/	(2) Hazardous materials descriptions and proper shipping names	(3) Hazard class	(3A) ID Number	(4) Label(s) required (if not excepted)	(5) Packaging		(6) Maximum net quantity in one package		(7) Water Shipments		
					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
	Insecticide, liquefied gas (containing no Poison A or B material)	Non- flammable gas	NA1968	Non- flammable gas	173.306	173.304	150 pounds	300 pounds	1,3	1,3	
	Insecticide, liquefied gas, containing Poison A material or Poison B material	Poison A	NA1967	Poison gas	None	173.329 173.334	Forbidden	Forbidden	1	5	4
	Insecticide, liquid, n.o.s.	Combustible liquid	NA1993	None	173.118a	None	No limit	No limit	1,2	1,2	
	Insecticide, liquid, n.o.s.	Flammable liquid	NA1993	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	Insecticide, liquid, n.o.s.	Poison B	NA2902	Poison	173.345	173.346	1 quart	55 gallons	1,2	1,2	
W	Insulation tape (varnished cloth type). See Oiled material										
	Inulin trinitrate (dry)	Forbidden									
	Iodine azide (dry)	Forbidden									
	Iodine monochloride	Corrosive material	UN1792	Corrosive	None	173.293	Forbidden	1 quart	1	5	13
	Iodine pentafluoride	Oxidizer	UN2495	Oxidizer and Poison	None	173.246	Forbidden	100 pounds	1	1	13
	Iodoxy compounds (dry)	Forbidden									
	Iridium nitratopentamine iridium nitrate	Forbidden									
E	Iron chloride, solid. See Ferric chloride, solid										
	Iron mass or sponge, not properly oxidized	Flammable solid	NA1383	Flammable solid	None	173.174	Forbidden	Forbidden	1,2	5	29
	Iron mass or sponge, spent	Flammable solid	UN1376	Flammable solid	None	173.174	Forbidden	Forbidden	1,2	5	29
	Iron oxide, spent. See Iron mass or sponge, spent										
E	Iron sesquichloride, solid. See Ferric chloride										
	Irritating agent, n.o.s.	Irritating material	NA1693	Irritant	173.382		Forbidden	75 pounds	1	1	44
	Isobutane or Liquefied petroleum gas. See Liquefied petroleum gas										
E	Isobutyl acetate (RQ-5000/2270)	Flammable liquid	UN1213	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
E	Isobutylamine (RQ-1000/454)	Flammable liquid	UN1214	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
E	Isobutylene or Liquefied petroleum gas. See Liquefied petroleum gas										
E	Isobutyric acid (RQ-5000/2270)	Corrosive material	UN2529	Corrosive	173.244	173.245	1 quart	10 gallons	1,2	1,2	
	Isobutyric anhydride	Corrosive material	UN2530	Corrosive	173.244	173.245	1 quart	10 gallons	1,2	1,2	
	Isononanoyl peroxide, technically pure or Isononanoyl peroxide, in solution. See Organic peroxide, liquid or solution, n.o.s.		UN2128								

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(1) +/ E/ A/ W/	(2) Hazardous materials descriptions and proper shipping names	(3) Hazard class	(3A) ID Number	(4) Label(s) required (if not excepted)	(5) Packaging		(6) Maximum net quantity in one package		(7) Water Shipments		
					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
	Isooctane	Flammable liquid	UN1262	Flammable liquid	173.118	173.119	1 quart	10 gallons	1.2	1	
	Isooctene	Flammable liquid	UN1216	Flammable liquid	173.118	173.119	1 quart	10 gallons	1.3	4	
	Isopentane	Flammable liquid	UN1265	Flammable liquid	173.118	173.119	Forbidden	10 gallons	1.3	4	
	Isopentanoic acid	Corrosive material	NA1760	Corrosive	173.244	173.245	1 quart	10 gallons	1.2	1,2	
E	Isoprene (RQ-1000/454)	Flammable liquid	UN1218	Flammable liquid	173.118	173.119	Forbidden	10 gallons	1.3	4	
	Isopropanol	Flammable liquid	UN1219	Flammable liquid	173.118	173.125	1 quart	10 gallons	1.2	1	
E	Isopropanolamine dodecylbenzenesulfonate (RQ-1000/454)	ORM-E	NA9127	None	None	173.510	No limit	No limit	1.2	1,2	
	Isopropyl acetate	Flammable liquid	UN1220	Flammable liquid	173.118	173.119	1 quart	10 gallons	1.2	1	
	Isopropyl acid phosphate, solid	Corrosive material	UN1793	Corrosive	173.244	173.245b	25 pounds	100 pounds	1.2	1.2	
	Isopropyl alcohol. See Isopropanol										
	Isopropylamine	Flammable liquid	UN1221	Flammable liquid	None	173.119	Forbidden	10 gallons	1.3	5	
	Isopropyl mercaptan	Flammable liquid	UN2703	Flammable liquid	None	173.141	Forbidden	10 gallons	1.3	5	
	Isopropyl nitrate	Flammable liquid	UN1222	Flammable liquid	173.118	173.119	1 quart	10 gallons	1.2	1	
	Isopropyl percarbonate, stabilized	Organic peroxide	NA2134	Organic peroxide	None	173.282	Forbidden	Forbidden	5	5	
	Isopropyl percarbonate, un- stabilized	Organic peroxide	NA2133	Organic peroxide	None	173.218	Forbidden	Forbidden	5	5	
	Isopropyl peroxydicarbonate, technically pure. See Isopropyl percarbonate, unstabilized		UN2133								
	Isopropyl peroxydicarbonate, not more than 52% in solution. See Organic peroxide, liquid or solution, n.o.s.		UN2134								
	Isopropyl phosphoric acid, solid. See Isopropyl acid phosphate, solid										
	Isothiocyanic acid (polymeriza- tion hazard)	Forbidden									
	Jet thrust igniter. See Igniter, jet thrust										
	Jet thrust unit (jatu)	Class A explosive		Explosive A	None	173.79	Forbidden	Forbidden	6	5	
	Jet thrust unit (jatu)	Class B explosive		Explosive B	None	173.92	Forbidden	550 pounds	1.3	5	
W	Jute. See Fibers										
W	Kapok. See Fibers										
E	Kelthane (RQ-5000/2270)	ORM-E	NA2761	None	None	173.510	No limit	No limit	1.2	1,2	
E	Kepone (RQ-1/0-454)	ORM-E	NA2761	None	None	173.510	No limit	No limit	1.2	1,2	

ILLINOIS HAZARDOUS MATERIALS TRANSPORTATION REGULATIONS

§172.101 HAZARDOUS MATERIALS TABLE

(1) +/ E/ A/ W/	(2) Hazardous materials descriptions and proper shipping names	(3) Hazard class	(3A) ID Number	(4) Label(s) required (if not excepted)	(5) Packaging		(6) Maximum net quantity in one package		(7) Water Shipments		
					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
	Kerosene	Combustible liquid	UN1223	None	173.118a	None	No limit	No limit	1,2	1,2	
	Lacquer. See Paint, Enamel, Lacquer, Stain, etc.										
	Lacquer base or Lacquer chips, plastic (wet with alcohol or solvent)	Flammable liquid	UN1263	Flammable liquid	173.118	173.127	1 quart	25 pounds	1,2	1	
	Lacquer base, or lacquer chips, dry	Flammable solid	NA2557	Flammable solid	173.153	173.175	25 pounds	100 pounds	1	1	
	Lacquer base, liquid. See Paint, Enamel, Lacquer, Stain, etc.										
	Lacquer removing, reducing, or thinning compound. See Compound, lacquer, paint, or varnish, removing, reducing or thinning liquid										
	Lauroyl peroxide	Organic peroxide	UN2124	Organic peroxide	173.153	173.157 173.158	2 pounds	25 pounds	1,2	1	
	Lauroyl peroxide, not more than 42%, stable dispersion in water. See Organic peroxide, liquid or solution, n.o.s.										
	Lauroyl peroxide, technically pure. See Lauroyl peroxide.		UN2124								
E	Lead acetate (RQ-5000/2270)	ORM-E	UN1616	None	None	173.510	No limit	No limit	1,2	1,2	
E	Lead arsenate, solid (RQ-5000/2270)	Poison B	UN1617	Poison	173.364	173.367	50 pounds	200 pounds	1,2	1,2	
	Lead, arsenite, solid	Poison B	UN1618	Poison	173.364	173.365	50 pounds	200 pounds	1,2	1,2	
	Lead azide. See Initiating explosive										
	Lead azide (dry)	Forbidden									
EA	Lead chloride (RQ-5000/2270)	ORM-B	NA2291	None	173.505	173.800	25 pounds	100 pounds	1,2	1,2	
	Lead cyanide	Poison B	UN1620	Poison	173.370		25 pounds	No limit	1,2	1,2	32
W	Lead dross (containing 3% or more free acid)	ORM-C	NA1794	None	173.505	173.1010			1,2	1,2	94
EA	Lead fluoborate (RQ-5000/2270)	ORM-B	NA2291	None	173.505	173.510	25 pounds	100 pounds	1,2	1,2	
EA	Lead fluoride (RQ-1000/454)	ORM-B	NA2811	None	173.505	173.510	25 pounds	100 pounds	1,2	1,2	
E	Lead iodide (RQ-5000/2270)	ORM-E	NA2811	None	None	173.510	No limit	No limit	1,2	1,2	
	Lead mononitroresorcinate. See Initiating explosive										
	Lead mononitroresorcinate (dry)	Forbidden									
E	Lead nitrate (RQ-5000/2270)	Oxidizer	UN1469	Oxidizer	173.153	173.182	25 pounds	100 pounds	1,2	1,2	60
	Lead peroxide	Oxidizer	UN1872	Oxidizer	173.153	173.154	25 pounds	100 pounds	1,2	1,2	60
	Lead picrate (dry)	Forbidden									
W	Lead scrap. See Lead dross										
E	Lead stearate (RQ-5000/2270)	ORM-E	NA2811	None	None	173.510	No limit	No limit	1,2	1,2	

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(1) +/ E/ A/ W/	(2) Hazardous materials descriptions and proper shipping names	(3) Hazard class	(3A) ID Number	(4) Label(s) required (if not excepted)	(5) Packaging		(6) Maximum net quantity in one package		(7) Water Shipments		
					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
	Lead styphnate (dry)	Forbidden									
	Lead styphnate (Lead trinitron- sacconinate). See Initiating explosive	Forbidden									
E	Lead sulfate (RQ-5000/2270)	ORM-E	NA2291	None	None	173.510	No limit	No limit	1,2	1,2	
E	Lead sulfate, solid (containing more than 3% free acid) (RQ-5000/2270)	Corrosive material	UN1794	Corrosive	173.244	173.245b	25 pounds	100 pounds	1,2	1,2	
E	Lead sulfide (RQ-5000/2270)	ORM-E	NA2291	None	None	173.510	No limit	No limit	1,2	1,2	
E	Lead thiocyanate (RQ-5000/2270)	ORM-E	NA2291	None	None	173.510	No limit	No limit	1,2	1,2	
	Leather bleach or dressing	Flammable liquid	NA1142	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	Leather bleach or dressing	Combust- ible liquid	NA1142	None	173.118a	None	No limit	No limit	1,2	1,2	
	Life rafts, inflatable	ORM-C		None	None	173.906	1 per inacces- sible cargo compart- ment	No limit	1,2	1,2	
	Lighter fluid	Flammable liquid	UN1226	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	Lime-nitrogen. See Calcium cyanamide, not hydrated										
	Lime, unslaked. See Calcium oxide										
EA	Lindane (RQ-1/.454)	ORM-A	NA2761	None	173.505	173.510	No limit	No limit	1,2	1,2	
+	Liquefied hydrocarbon gas. See Hydrocarbon gas, liquefied										
	Liquefied nonflammable gas (charged with nitrogen, carbon dioxide, or air)	Non- flammable gas	NA1058	Non- flammable gas	173.306	173.304	300 pounds	300 pounds	1,2	1,2	
+	Liquefied petroleum gas	Flammable gas	UN1075	Flammable gas	173.306	173.304 173.314 173.315	Forbidden	300 pounds	1,2	1	
	Liquid other than one classed as flammable, corrosive, poison or irritant, charged with nitrogen, carbon dioxide, or air. See Compressed gas n.o.s.										
	Lithium acetylde-ethylene diamine complex	Flammable solid	NA2813	Flammable solid and Dangerous when wet	None	173.206	Forbidden	25 pounds	1,2	5	14
	Lithium aluminum hydride	Flammable solid	UN1410	Flammable solid and Dangerous when wet	None	173.206	Forbidden	25 pounds	1,2	5	14
	Lithium aluminum hydride, ethereal	Flammable liquid	UN1411	Flammable liquid	None	173.137	Forbidden	1 quart	1	5	14
	Lithium amide, powdered	Flammable solid	UN1412	Flammable solid	173.153	173.168	25 pounds	100 pounds	1,2	4	14
	Lithium battery. See 173.206(f).										
	Lithium borohydride	Flammable solid	UN1413	Flammable solid and Dangerous when wet	None	173.206	Forbidden	25	1,2	5	14

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§172.101 HAZARDOUS MATERIALS TABLE

(1) +/ E/ A/ W/	(2) Hazardous materials descriptions and proper shipping names	(3) Hazard class	(3A) ID Number	(4) Label(s) required (if not excepted)	(5) Packaging		(6) Maximum net quantity in one package		(7) Water Shipments		
					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
E	Lithium chromate (RQ-1000/454)	ORM-E	NA9134	None	None	173.510	No limit	No limit	1,2	1,2	
	Lithium ferrosilicon	Flammable solid	UN2830	Flammable solid and Dangerous when wet	None	173.206	Forbidden	25 pounds	1,2		14
	Lithium hydride	Flammable solid	UN1414	Flammable solid and Dangerous when wet	None	173.206	Forbidden	25 pounds	1,2	5	14
	Lithium hydride in fused solid form	Flammable solid	UN2805	Flammable solid and Dangerous when wet	None	173.206	Forbidden	100 pounds	1,2	5	14
	Lithium hypochlorite compound, dry (containing more than 39% available chlorine)	Oxidizer	UN1471	Oxidizer	173.153	173.217	50 pounds	100 pounds	1,2	1,2	
	Lithium metal	Flammable solid	UN1415	Flammable solid and Dangerous when wet	None	173.206	Forbidden	25 pounds	1,2	5	14
	Lithium metal, in cartridges	Flammable solid	UN1415	Flammable solid and Dangerous when wet	173.206	173.206	1 pound	25 pounds	1,2	4	14
	Lithium nitride	Flammable solid	UN2806	Flammable solid and Dangerous when wet	None	173.206	Forbidden	25 pounds	1,2	5	14
	Lithium peroxide	Oxidizer	UN1472	Oxidizer	173.153	173.154	25 pounds	100 pounds	1,2	1,2	13
	Lithium silicon	Flammable solid	UN1417	Flammable solid and Dangerous when wet	None	173.206	Forbidden	25 pounds	1,2	1,2	14
	London purple, solid	Poison B	UN1621	Poison	173.364	173.365	50 pounds	200 pounds	1,2	1,2	
	Low blasting explosives. See Low explosive										
	Low explosive	Class A explosive		Explosive A	None	173.60	Forbidden	Forbidden	6	5	
	Lye. See Sodium hydroxide, solid										

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(1) +/ E/ A/ W/	(2) Hazardous materials descriptions and proper shipping names	(3) Hazard class	(3A) ID Number	(4) Label(s) required (if not excepted)	(5) Packaging		(6) Maximum net quantity in one package		(7) Water Shipments		
					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
+	Magnesium arsenate, solid	Poison B	UN1622	Poison	173.364	173.367	50 pounds	200 pounds	1,2	1,2	
	Magnesium dross, wet or hot. See 173.173	Forbidden									
	Magnesium, metal (powdered, pellets, turnings, or ribbons)	Flammable solid	UN1869	Flammable solid and Dangerous when wet	173.153	173.220	25 pounds	100 pounds	1,2	1,2	14
	Magnesium nitrate	Oxidizer	UN1474	Oxidizer	173.153	173.182	25 pounds	100 pounds	1,2	1,2	
	Magnesium perchlorate	Oxidizer	UN1475	Oxidizer	173.153	173.154	25 pounds	100 pounds	1,3	1,3	21
	Magnesium peroxide, solid	Oxidizer	UN1476	Oxidizer	173.153	173.154	25 pounds	100 pounds	1,2	1,2	13
	Magnesium scrap (borings, clippings, shavings, sheet, turnings, or scalplings)	Flammable solid	NA1869	Flammable solid and Dangerous when wet	173.153	173.220	Forbidden	Forbidden	1,2	1,2	14
A	Magnetized material	ORM-C	UN2807	Magnetized material	None	173.1020	No limit	No limit			
EA	Malathion (RQ-10/4.54)	ORM-A	NA2783	None	173.505	173.510	No limit	No limit	1,2	1,2	
EA	Maleic acid (RQ-5000/2270)	ORM-A	NA2215	None	173.505	173.510	50 pounds	200 pounds	1,2	1,2	95
EAW	Maleic anhydride (RQ-5000/2270)	ORM-A	UN2215	None	173.505	173.510	50 pounds	200 pounds	1,2	1,2	60
	Mannitan tetranitrate	Forbidden									
	Matches, block. See Matches, strike anywhere										
	Matches, safety, book, card, or strike-on-box	Flammable solid	UN1944	Flammable solid	173.176	173.176	50 pounds	50 pounds	1,2	1	
	Matches, strike anywhere	Flammable solid	UN1331	Flammable solid	None	173.176	Forbidden	Forbidden	1,2	1	
E	Matting acid. See Sulfuric acid										
	Medicines, n.o.s.	Combust- ible liquid	UN1851	None	173.118a	None	No limit	No limit	1,2	1,2	
	Medicines, n.o.s.	Flammable liquid	UN1851	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	Medicines, n.o.s.	Flammable solid	UN1851	Flammable solid	173.153	173.154	25 pounds	100 pounds	1,2	1,2	
	Medicines, n.o.s.	Oxidizer	UN1851	Oxidizer	173.153	173.154	25 pounds	100 pounds	1,2	1,2	
	Medicines, liquid, n.o.s.	Corrosive material	UN1851	Corrosive	173.244	173.245	1 quart	1 quart	1,2	1,2	
	Medicines, liquid, n.o.s.	Poison B	UN1851	Poison	173.345	173.346	1 quart	55 gallons	1,3	1	
	Medicines, solid, n.o.s.	Corrosive material	UN1851	Corrosive	173.244	173.245b	25 pounds	100 pounds	1,2	1,2	13
	Medicines, solid, n.o.s.	Poison B	UN1851	Poison	173.364	173.365	50 pounds	200 pounds	1,3	1,3	
	Mentetrahydro phthalic anhydride	Corrosive material	NA1760	Corrosive	None	173.298	Forbidden	1 quart	1,2	1	
	p-Menthane hydroperoxide, technically pure. See Para- menthane hydroperoxide		UN2125								

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(1) +/ E/ A/ W/	(2) Hazardous materials descriptions and proper shipping names	(3) Hazard class	(3A) ID Number	(4) Label(s) required (if not excepted)	(5) Packaging		(6) Maximum net quantity in one package		(7) Water Shipments		
					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
	Mercaptan mixture, aliphatic	Flammable liquid	NA1228	Flammable liquid	None	173.141	Forbidden	10 gallons	1,3	5	
	Mercaptan mixture, aliphatic (in containers over 110 gallons)	Combust- ible liquid	NA1228	None	173.118a	None	Forbidden	10 gallons	1,2	1,2	
AW	Mercaptan mixture, aliphatic (in containers of 110 gallons or less). See 173.141(b)	ORM-A	NA1228	None	173.505	173.510	Forbidden	10 gallons	1,3	5	96
E	Mercaptodimethur (RQ-100/45.4)	ORM-E	NA2757	None	None	173.510	No limit	No limit	1,2	1,2	
+	Mercuric acetate	Poison B	UN1629	Poison	173.364	173.365	50 pounds	200 pounds	1,2	1,2	
+	Mercuric-ammonium chloride, solid	Poison B	UN1630	Poison	173.364	173.365	50 pounds	200 pounds	1,2	1,2	
+	Mercuric benzoate, solid	Poison B	UN1631	Poison	173.364	173.365	50 pounds	200 pounds	1,2	1,2	
+	Mercuric bromide, solid	Poison B	UN1634	Poison	173.364	173.365	Forbidden	25 pounds	1,2	1,2	
	Mercuric chloride, solid	Poison B	UN1624	Poison	173.364	173.372	Forbidden	25 pounds	1,2	1,2	
+E	Mercuric cyanide, solid (RQ-1/454)	Poison B	UN1636	Poison	173.370		25 pounds	200 pounds	1,2	1,2	32
	Mercuric iodide, solid	Poison B	UN1638	Poison	173.364	173.365	50 pounds	200 pounds	1,2	1,2	
	Mercuric iodide, solution	Poison B	NA1638	Poison	173.365	173.366	1 quart	55 gallons	1,2	1,2	
E	Mercuric nitrate (RQ-10/4.54)	Oxidizer	UN1625	Oxidizer	173.153	173.182	25 pounds	100 pounds	1,2	1,2	45
+	Mercuric oleate, solid	Poison B	UN1640	Poison	173.364	173.365	50 pounds	200 pounds	1,2	1,2	
	Mercuric oxide, solid	Poison B	UN1641	Poison	173.364	173.365	50 pounds	200 pounds	1,2	1,2	
+	Mercuric oxycyanide, solid (desensitized)	Poison B	UN1642	Poison	173.364	173.365	25 pounds	200 pounds	1,2	1,2	32
+	Mercuric-potassium cyanide, solid	Poison B	UN1626	Poison	173.364	173.365 173.370	25 pounds	200 pounds	1,2	1,2	32
+	Mercuric-potassium iodide, solid	Poison B	UN1643	Poison	173.364	173.365	50 pounds	200 pounds	1,2	1,2	
+	Mercuric salicylate solid	Poison B	UN1644	Poison	173.364	173.365	50 pounds	200 pounds	1,2	1,2	
+	Mercuric subsulfate, solid	Poison B	NA2025	Poison	173.364	173.365	50 pounds	200 pounds	1,2	1,2	
+E	Mercuric sulfate, solid (RQ-10/4.54)	Poison B	UN1645	Poison	173.364	173.365	50 pounds	200 pounds	1,2	1,2	
+E	Mercuric sulfocyanate, solid OR Mercuric thiocyanate, solid (RQ-10/4.54)	Poison B	UN1646	Poison	173.364	173.365	50 pounds	200 pounds	1,2	1,2	
+	Mercuriol OR Mercury nucleate, solid	Poison B	UN1639	Poison	173.364	173.365	50 pounds	200 pounds	1,2	1,2	
+	Mercurous acetate, solid	Poison B	UN1629	Poison	173.364	173.365	50 pounds	200 pounds	1,2	1,2	
	Mercurous azide	Forbidden									
+	Mercurous bromide, solid	Poison B	UN1634	Poison	173.364	173.365	50 pounds	200 pounds	1,2	1,2	

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					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
	+ Mercurous gluconate, solid	Poison B	UN1637	Poison	173.364	173.365	50 pounds	200 pounds	1,2	1,2	
	+ Mercurous iodide, solid	Poison B	UN1638	Poison	173.364	173.365	50 pounds	200 pounds	1,2	1,2	
E	Mercurous nitrate, solid (RQ-10/4.54)	Oxidizer	UN1627	Oxidizer	173.153	173.154	50 pounds	100 pounds	1,2	1,2	
	+ Mercurous oxide, black, solid	Poison B	UN1641	Poison	173.364	173.365	50 pounds	200 pounds	1,2	1,2	
	+ Mercurous sulfate, solid	Poison B	UN1628	Poison	173.364	173.365	50 pounds	200 pounds	1,2	1,2	
	Mercury acetylide	Forbidden									
	Mercury based pesticide, liquid, n.o.s. (compounds and prepara- tions),	Flammable liquid	UN2778	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	Mercury based pesticide, liquid, n.o.s. (compounds and prepara- tions),	Poison B	UN2777	Poison	173.345	173.346	1 quart	55 gallons	1,2	1,2	
	Mercury based pesticide, solid, n.o.s. (compounds and prepara- tions),	Poison B	UN2777	Poison	173.364	173.365	50 pounds	200 pounds	1,2	1,2	
	Mercury compound, solid, n.o.s.	Poison B	UN2025	Poison	173.364	173.365	50 pounds	200 pounds	1,2	1,2	
	Mercury fulminate. See Initiat- ing explosive										
	Mercury iodide aquabasic ammono- basis (Iodine of Millon's base)	Forbidden									
A	Mercury, metallic	ORM-B	NA2809	None	None	173.860	173.860	See 173.860			
	Mercury nitride	Forbidden									
	Mercury oxycyanide	Forbidden									
	Mesityl oxide	Flammable liquid	UN1229	Flammable liquid	None	173.119	1 quart	10 gallons	1,2	1,2	
	Metal alkyl, solution, n.o.s.	Flammable liquid	NA9195	Flammable liquid	173.118	173.119	1 quart	1 gallon	1,2	1	
W	Metal borings, shavings, turnings, or cuttings (ferrous metals only, except stainless steel)	ORM-C	UN2793	None	173.505	173.1025			1,2	1,2	97
	Metal salts of methyl nitramine (dry)	Forbidden									
	+ Methane	Flammable gas	UN1971	Flammable gas	173.306	173.302	Forbidden	300 pounds	1,2	4	
	Methanol. See Methyl alcohol										
	Metaacetic acid	Forbidden									
E	Methoxychlor (RQ-1/0.454)	ORM-E	NA2761	None	None	173.510	No limit	No limit	1,2	1,2	
	Methyl acetate	Flammable liquid	UN1231	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	Methyl acetone	Flammable liquid	UN1232	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	+ Methylacetylene-propadiene, stabilized	Flammable gas	UN1060	Flammable gas	173.306	173.304 173.314 173.315	Forbidden	300 pounds	1,2	1	
	Methyl acrylate, inhibited	Flammable liquid	UN1919	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	

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					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
	Methylal	Flammable liquid	UN1234	Flammable liquid	None	173.119	Forbidden	10 gallons	1,3	5	
	Methyl alcohol	Flammable liquid	UN1230	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
+E	Methylamine, anhydrous (RQ-1000/454)	Flammable gas	UN1061	Flammable gas	173.306	173.304 173.314 173.315	Forbidden	300 pounds	1	4	
E	Methylamine, aqueous solution (RQ-1000/454)	Flammable liquid	UN1235	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,3	4	100
	Methylamine dinitramine and dry salts thereof	Forbidden									
	Methylamine nitroform	Forbidden									
	Methylamine perchlorate (dry)	Forbidden									
	Methylamyl acetate	Flammable liquid	UN1233	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1,2	
	Methyl amyl ketone	Combust- ible liquid	UN1110	None	173.118a	None	No limit	No limit	1,2	1,2	
+	Methyl bromide and more than 2% chloropicrin mixture, liquid	Poison B	NA1581	Poison	None	173.353	Forbidden	Forbidden	1	5	4
+	Methyl bromide and nonflammable, nonliquefied compressed gas mixture, liquid (including up to 2% chloropicrin)	Poison B	NA1955	Poison	None	173.353a	Forbidden	300 pounds	1	5	44
+E	Methyl bromide - ethylene dibromide mixture, liquid (RQ-1000/454)	Poison B	UN1647	Poison	None	173.353	Forbidden	55 gallons	1	1	
+	Methyl bromide, liquid (including up to 2% chloropicrin)	Poison B	UN1062	Poison	None	173.353	Forbidden	55 gallons	1	5	98
	Methyl butene	Flammable liquid	UN2460	Flammable liquid	None	173.119	Forbidden	10 gallons	1,2	5	
	Methyl butyrate	Flammable liquid	UN1237	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	Methyl cellosolve. See Ethylene glycol monomethyl ether										
	Methyl cellosolve acetate. See glycol monomethyl ether acetate										
+	Methyl chloride	Flammable gas	UN1063	Flammable gas	173.306	173.304 173.314 173.315	Forbidden	300 pounds	1,2	4	
+	Methyl chloride-methylene chloride mixture	Flammable gas	UN1912	Flammable gas	173.306	173.304 173.314	Forbidden	300 pounds	1,2	4	
	Methyl chlorocarbonate. See Methyl chloroformate										
A	Methyl chloroform. See 1,1,1- Trichloroethane										
	Methyl chloroformate	Flammable liquid	UN1238	Flammable liquid and Poison	None	173.288	Forbidden	5 pints	1,2	1	
	Methylchloromethyl ether, anhydrous	Flammable liquid	UN1239	Flammable liquid and Poison	None	173.143	Forbidden	Forbidden	1	5	4
	Methylcyclohexane	Flammable liquid	UN2296	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	

ILLINOIS HAZARDOUS MATERIALS TRANSPORTATION REGULATIONS

§172.101 HAZARDOUS MATERIALS TABLE

(1) +/ E/ A/ W/	(2) Hazardous materials descriptions and proper shipping names	(3) Hazard class	(3A) ID Number	(4) Label(s) required (if not excepted)	(5) Packaging		(6) Maximum net quantity in one package		(7) Water Shipments		
					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
	Methylcyclopentane	Flammable liquid	UN2298	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,3	4	
	Methyl dichloroacetate	Corrosive material	UN2299	Corrosive	173.244	173.245	1 quart	1 quart	1,2	1,2	
	Methyldichloroarsine	Poison A	NA1556	Poison gas	None	173.328	Forbidden	Forbidden	1	5	4
	Methyl dichlorosilane	Flammable liquid	UN1242	Flammable liquid	None	173.136	Forbidden	5 pints	1,2	1	
	Methylene chloride. <i>See</i> Dichloromethane										
	Methylene glycol dinitrate	Forbidden									
	Methyl ethyl ether. <i>See</i> Ethyl methyl ether										
	Methyl ethyl ketone	Flammable liquid	UN1193	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	Methyl ethyl ketone peroxide, in solution with not more than 9% by weight active oxygen. <i>See</i> Organic peroxide, liquid, or solution, n.o.s.		UN2550								
	Methyl ethyl ketone peroxide, in solution with more than 9% by weight active oxygen	Forbidden									
	Methyl ethyl pyridine	Corrosive material	UN2300	Corrosive	173.244	173.245	1 quart	10 gallons	1,2	1,2	
	Methyl formate	Flammable liquid	UN1243	Flammable liquid	173.118	173.119	Forbidden	10 gallons	1,3	4	
	Methylfuran	Flammable liquid	UN2301	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,3	4	
	α -Methylglucoside tetranitrate	Forbidden									
	α -Methylglycerol trinitrate	Forbidden									
	Methylhydrazine	Flammable	UN1244	Flammable liquid and poison	None	173.145	Forbidden	5 pints	1,2	1	99
	Methyl isobutyl ketone peroxide, in solution with not more than 9% by weight active oxygen. <i>See</i> Organic peroxide, liquid or solution, n.o.s.		UN2126								
	Methyl isobutyl ketone peroxide, in solution with more than 9% by weight active oxygen	Forbidden									
	Methyl isopropenyl ketone, inhibited	Flammable liquid	UN1246	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	Methyl magnesium bromide in ethyl ether not over 40% concentration	Flammable liquid	UN1928	Flammable liquid	None	173.149	Forbidden	Forbidden	1	1	63
+E	Methyl mercaptan (RQ-100/45.4)	Flammable gas	UN1064	Flammable gas	173.306	173.304 173.314 173.315	Forbidden	300 pounds	1,2	1	
E	Methyl methacrylate monomer, inhibited (RQ-5000/2270)	Flammable liquid	UN1247	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
E	Methyl methacrylate monomer, uninhibited (high-purity, if acceptable under 173.21 of this subchapter) (RQ-5000/2270)	Flammable liquid	NA1247	Flammable liquid	173.118	173.119	Forbidden	Forbidden	1,2	1	

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(1) +/ E/ A/ W/	(2) Hazardous materials descriptions and proper shipping names	(3) Hazard class	(3A) ID Number	(4) Label(s) required (if not excepted)	(5) Packaging		(6) Maximum net quantity in one package		(7) Water Shipments		
					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
	<i>Methyl nitrate</i>	Forbidden									
	N-Methyl-N'-nitro-N-nitro- guanidine (not exceeding 25 grams in one outside packaging)	Flammable solid	NA1325	Flammable solid	None	173.179	Forbidden	Forbidden	4	5	
	Methyl norbornene dicarboxylic anhydride. See Menthetrahydro phthalic anhydride										
E	Methyl parathion, liquid (RQ-100/45.4)	Poison B	NA2783	Poison	None	173.358	Forbidden	1 quart	1,3	1,3	
E	Methyl parathion mixture, dry (RQ-100/45.4)	Poison B	NA2783	Poison	173.377	173.377	50 pounds	200 pounds	1,2	1,2	
E	Methyl parathion mixture, liquid (containing 25% or less methyl parathion) (RQ-100/45.4)	Poison B	NA2783	Poison	None	173.359	1/2 pint	1 quart	1,2	1,2	
E	Methyl parathion mixture, liquid, (containing over 25% methyl parathion) (RQ-100/45.4)	Poison B	NA2783	Poison	None	173.359	Forbidden	1 quart	1,2	1,2	
	Methylpentadiene	Flammable liquid	UN2461	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	Methyl pentane	Flammable liquid	UN2462	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	Methyl phosphonothioic dichloride, anhydrous	Corrosive material	NA1760	Corrosive	173.244	173.245 173.245a	1 quart	1 quart	1	4	
	Methyl phosphonous dichloride	Corrosive material	NA2845	Corrosive	173.244	173.245 173.245a	1 quart	1 quart	1	4	
	<i>Methyl picric acid (heavy metal salts of)</i>	Forbidden									
	Methyl propionate	Flammable liquid	UN1248	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	Methyl propyl ketone	Flammable liquid	UN1249	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	Methyl sulfate. See Dimethyl sulfate										
	Methyl sulfide. See Dimethyl sulfide										
	Methyltrichlorosilane	Flammable liquid	UN1250	Flammable liquid	None	173.135	Forbidden	10 gallons	1,2	1	
	<i>Methyl trimethylol methane trinitrate</i>	Forbidden									
	Methyl vinyl ketone, inhibited	Flammable liquid	UN1251	Flammable liquid	173.147	173.147	4 ounces	10 gallons	1,2	1	
E	Mevinphos (RQ-1/0.454)	Poison B	NA2783	Poison	None	173.358	Forbidden	1 quart	1,2	5	
E	Mevinphos mixture, dry (RQ-1/0.454)	Poison B	NA2783	Poison	173.377	173.377	Forbidden	200 pounds	1,2	4	
E	Mevinphos mixture, liquid (RQ-1/0.454)	Poison B	NA2783	Poison	173.359	173.359	1/2 pint	1 quart	1,2	5	
E	Mexacarbate (RQ-1000/454)	Poison B	NA2757	Poison	173.364	173.365	50 pounds	200 pounds	1,2	1,2	
	Mild detonating fuse, metal clad. See Fuse, mild detonating, metal clad										
	Mine, empty. See 173.55										
	Mine explosive, with gaseous material. See Explosive mine										

ILLINOIS HAZARDOUS MATERIALS TRANSPORTATION REGULATIONS

§172.101 HAZARDOUS MATERIALS TABLE

(1) +/ E/ A/ W/	(2) Hazardous materials descriptions and proper shipping names	(3) Hazard class	(3A) ID Number	(4) Label(s) required (if not excepted)	(5) Packaging		(6) Maximum net quantity in one package		(7) Water Shipments		
					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
	Mine rescue equipment containing carbon dioxide	Non-flammable gas	NA1956	Non-flammable gas	173.306		150 pounds	300 pounds	1,2	1,2	
	Mining reagent, liquid (containing 20% or more cresylic acid)	Corrosive material	NA2022	Corrosive	173.244	173.249a	1 quart	10 gallons	1,2	1,2	
A	Mipsafox	ORM-A	UN2783	None	173.505	173.510	No limit	No limit			
E	Mixed acid. See Nitrating acid										
A	Molybdenum pentachloride	ORM-B	UN2508	None	173.505	173.800	25 pounds	100 pounds			
	Monobromotrifluoromethane	Non-flammable gas	UN1009	Non-flammable gas	173.306	173.304 173.314	150 pounds	300 pounds	1,2	1,2	
	Monochloroacetone, stabilized or inhibited	Irritating material	UN1695	Irritant	None	173.384	Forbidden	5 gallons	1	1	44
	Monochloroacetone (unstabilized)	Forbidden									
	Monochlorodifluoromethane	Non-flammable gas	UN1018	Non-flammable gas	173.306	173.304 173.314 173.315	150 pounds	300 pounds	1,2	1,2	
	Monochloroethylene. See Vinyl chloride										
	Monochloropentafluoroethane	Non-flammable gas	UN1020	Non-flammable gas	173.306	173.304	150 pounds	300 pounds	1,2	1,2	
	Monochlorotetrafluoroethane	Non-flammable gas	UN1021	Non-flammable gas	173.306	173.304 173.314	150 pounds	300 pounds	1,2	1,2	
	Monochlorotrifluoromethane	Non-flammable gas	UN1022	Non-flammable gas	173.306	173.304	150 pounds	300 pounds	1,2	1,2	
	Monoethanolamine	Corrosive material	UN2491	Corrosive	173.244	173.245	1 quart	10 gallons	1,2	1,2	
E	Monoethylamine (RQ-1000/454)	Flammable liquid	UN1036	Flammable liquid	None	173.148	Forbidden	5 pints	1,2	5	72
	Monofluorophosphoric acid, anhydrous	Corrosive material	UN1776	Corrosive	None	173.275	Forbidden	1 gallon	1,2	1,2	13
	Morpholine	Flammable liquid	UN2054	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	Morpholine, aqueous, mixture	Flammable liquid	NA2054	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	Morpholine, aqueous, mixture	Corrosive material	NA1760	Corrosive	173.244	173.245	1 quart	10 gallons	1	4	
	Mortar stain, liquid	Combustible liquid	UN1263	None	173.118a	None	No limit	No limit	1,2	1,2	
	Mortar stain, liquid	Flammable liquid	UN1263	Flammable liquid	173.118	173.128	1 quart	55 gallons	1,2	1	
	Noth balls. See Naphthalene										
	Motion picture film. See Film										
E	Motor fuel antiknock compound or Antiknock compound (these materials may contain various hazardous substances for which the appropriate RQ applies)	Poison B	UN1649	Poison	None	173.354	Forbidden	55 gallons	1	5	11

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§172.101 HAZARDOUS MATERIALS TABLE

(1) +/ E/ A/ W/	(2) Hazardous materials descriptions and proper shipping names	(3) Hazard class	(3A) ID Number	(4) Label(s) required (if not excepted)	(5) Packaging		(6) Maximum net quantity in one package		(7) Water Shipments		
					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
	Motor fuel, n.o.s.	Combust- ible liquid	NA1203	None	173.118a	None	No limit	No limit	1,2	1,2	
	Motor fuel, n.o.s.	Flammable liquid	NA1203	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	Motor, internal combustion				173.120						
	Motor vehicle, etc., including automobile, motorcycle, truck, tractor, and other self-propelled vehicle or equipment powered by internal combustion engine, when offered new or used for transpor- tation and which contain fuel in the engine or fuel tank or the electric storage battery is connected to either terminal of the electrical system	ORM-C		None	173.120 173.250 173.257 173.306 175.305 176.905				1,2	1,2	
E	Muriatic acid. See Hydrochloric acid										
E	Naled (RQ-10/4.54)	ORM-E	NA2783	None	None	173.510	No limit	No limit	1,2	1,2	
	Naphtha	Combust- ible liquid	UN2553	None	173.118a	None	No limit	No limit	1,2	1,2	
	Naphtha	Flammable liquid	UN2553	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	Naphtha distillate	Combust- ible liquid	NA1268	None	173.118a	None	No limit	No limit	1,2	1,2	
	Naphtha distillate	Flammable liquid	NA1268	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
EA	Naphthalene or Naphthalin (RQ-5000/2270)	ORM-A	UN1334	None	173.505	173.655	25 pounds	300 pounds	1,2	1,2	101
	Naphthalene diozonide	Forbidden									
	Naphtha petroleum. See Petroleum naphtha										
	Naphtha, solvent	Combust- ible liquid	UN1256	None	173.118a	None	No limit	No limit	1,2	1,2	
	Naphtha, solvent	Flammable liquid	UN1256	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
E	Napthenic acid (RQ-100/45.4)	ORM-E	NA9137	None	None	173.510	No limit	No limit	1,2	1,2	
	Naphthyl aminaparchlorate	Forbidden									
	Natural gasoline. See Gasoline										
	Neohexane	Flammable liquid	UN1208	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,3	4	
	Neon	Non- flammable gas	UN1065	Non- flammable gas	173.306	173.302	150 pounds	300 pounds	1,2	1,2	
	New explosive or explosive device. See 173.51 and 173.86										
E	Nickel ammonium sulfate (RQ-5000/2270)	ORM-E	NA9138	None	None	173.510	No limit	No limit	1,2	1,2	
	Nickel carbonyl	Flammable liquid	UN1259	Flammable liquid and Poison	None	173.126	Forbidden	Forbidden	1	5	102

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(1) +/E/A/W/	(2) Hazardous materials descriptions and proper shipping names	(3) Hazard class	(3A) ID Number	(4) Label(s) required (if not excepted)	(5) Packaging		(6) Maximum net quantity in one package		(7) Water Shipments		
					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
	Nickel catalyst, wet, <i>finely divided, activated, or spent. With not less than 40% water or other suitable liquid</i>	Flammable solid	UN1378	Flammable solid	None	173.233	Forbidden	100 pounds	1,2	1	29
E	Nickel chloride (RQ-5000/2270)	ORM-E	NA9139	None	None	173.510	No limit	No limit	1,2	1,2	
+	Nickel cyanide, solid	Poison B	UN1653	Poison	173.370		25 pounds	200 pounds	1,2	1,2	32
E	Nickel hydroxide (RQ-1000/454)	ORM-E	NA9140	None	None	173.510	No limit	No limit	1,2	1,2	
E	Nickel nitrate (RQ-5000/2270)	Oxidizer	UN2725	Oxidizer	173.153	173.182	25 pounds	100 pounds	1,2	1,2	
	<i>Nickel picrate</i>	Forbidden									
E	Nickel sulfate (RQ-5000/2270)	ORM-E	NA9141	None	None	173.510	No limit	No limit	1,2	1,2	
	Nicotine hydrochloride	Poison B	UN1656	Poison	173.345	173.346	1 quart	55 gallons	1,2	1,2	
	Nicotine, liquid	Poison B	UN1654	Poison	None	173.346	Forbidden	55 gallons	1,2	1,2	
	Nicotine salicylate	Poison B	UN1657	Poison	173.364	173.365	50 pounds	200 pounds	1,2	1,2	
+	Nicotine sulfate, liquid	Poison B	UN1658	Poison	173.345	173.346	1 quart	55 gallons	1,2	1,2	
+	Nicotine sulfate, solid	Poison B	UN1658	Poison	173.364	173.365	50 pounds	200 pounds	1,2	1,2	
	Nicotine tartrate	Poison B	UN1659	Poison	173.364	173.365	50 pounds	200 pounds	1,2	1,2	
	<i>Nitrated paper (unstable)</i>	Forbidden									
	Nitrate, n.o.s.	Oxidizer	NA1477	Oxidizer	173.153	173.182	25 pounds	100 pounds	1,2	1,2	
	<i>Nitrate of ammonia explosives. See High explosive</i>										
	<i>Nitrates of diazonium compounds</i>	Forbidden									
E	Nitrating acid (RQ-1000/454)	Oxidizer	NA1796	Oxidizer	None	173.267	Forbidden	1 quart	1	5	88
E	Nitrating acid, spent (RQ-1000/454)	Corrosive material	NA1826	Corrosive	None	173.248	Forbidden	1 quart	1	5	
E	Nitric acid (over 40%) (RQ-1000/454)	Oxidizer	UN2031	Oxidizer and Corrosive	None	173.268	Forbidden	5 pints	1	5	105
E	Nitric acid, 40% or less (RQ-1000/454)	Corrosive material	NA1760	Corrosive	None	173.268	Forbidden	5 pints	1	5	104
E	Nitric acid, fuming (RQ-1000/454)	Oxidizer	UN2032	Oxidizer and Poison	None	173.268	Forbidden	Forbidden	1	5	105
	<i>Nitric ether. See Ethyl nitrate</i>										
	Nitric oxide	Poison A	UN1660	Poison gas	None	173.337	Forbidden	Forbidden	1	5	
	<i>2-Nitro-2-methylpropanol nitrate</i>	Forbidden									
	<i>6-Nitro-4-diazotoluene-3-sulfonic acid (dry)</i>	Forbidden									
	<i>p-Nitroaniline. See Nitroaniline</i>										
	<i>N-Nitroaniline</i>	Forbidden									
+	Nitroaniline	Poison B	UN1661	Poison	173.364	173.373	50 pounds	200 pounds	1,2	1,2	

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(1) +/ E/ A/ W/	(2) Hazardous materials descriptions and proper shipping names	(3) Hazard class	(3A) ID Number	(4) Label(s) required (if not excepted)	(5) Packaging		(6) Maximum net quantity in one package		(7) Water Shipments		
					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
E	<i>m</i> -Nitrobenzene diazonium perchlorate	Forbidden									
	Nitrobenzene, liquid or Nitrobenzol, liquid (oil of mirbane) (RQ-1000/454)	Poison B	UN1662	Poison	173.345	173.346	1 quart	55 gallons	1,2	1,2	
	Nitro carbonitrate. See Blasting agent, n.o.s.										
	Nitrocellulose, colloid, granular or flake, wet with not less than 20% alcohol or solvent, or block, wet with not less than 25% alcohol	Flammable liquid	NA2059	Flammable liquid	173.118	173.127	1 quart	25 pounds	1,3	1	
	Nitrocellulose, colloid, granular or flake, wet with not less than 20% water	Flammable solid	NA2555	Flammable solid	173.153	173.184	25 pounds	100 pounds	1,3	1	
	Nitrocellulose, dry. See High explosive										
	Nitrocellulose, wet with not less than 30% alcohol or solvent	Flammable liquid	NA2556	Flammable liquid	173.118	173.127	1 quart	25 pounds	1,3	1	
	Nitrocellulose, wet with not less than 20% water	Flammable solid	NA2555	Flammable solid	173.153	173.184	25 pounds	100 pounds	1,3	1	
	Nitrochlorobenzene, meta or para, solid	Poison B	UN1578	Poison	173.364	173.374	50 pounds	200 pounds	1,2	1,2	
	Nitrochlorobenzene, ortho, liquid	Poison B	UN1578	Poison	173.345	173.346	1 quart	55 gallons	1,2	1,2	
E	Nitroethylene polymer	Forbidden									
	Nitroethyl nitrate	Forbidden									
	Nitrogen	Non-flammable gas	UN1066	Non-flammable gas	173.306	173.302 173.314	150 pounds	300 pounds	1,2	1,2	
	Nitrogen dioxide, liquid (RQ-1000/454)	Poison A	UN1067	Poison gas and Oxidizer	None	173.336	Forbidden	Forbidden	1	5	106
	Nitrogen fertilizer solution	Non-flammable gas	NA1043	Non-flammable gas	173.306	173.304 173.314	150 pounds	300 pounds	1,3	1,3	
	Nitrogen peroxide, liquid	Poison A	NA1067	Poison gas and Oxidizer	None	173.336	Forbidden	Forbidden	1	5	106
	Nitrogen, pressurized liquid	Non-flammable gas	UN1977	Non-flammable gas	None	173.304	Forbidden	300 pounds	1,3	1,3	
	Nitrogen tetroxide, liquid	Poison A	NA1067	Poison gas and Oxidizer	None	173.336	Forbidden	Forbidden	1	5	106
	Nitrogen trichloride	Forbidden									
	Nitrogen trifluoride	Non-flammable gas	UN2451	Non-flammable gas	None	173.302	Forbidden	300 pounds	1	5	154
	Nitrogen triiodide	Forbidden									
	Nitrogen triiodide monoamine	Forbidden									
	Nitroglycerin, liquid, desensitized. See High explosive, liquid										
	Nitroglycerin, liquid, not desensitized. See 173.51	Forbidden									

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(1) +/ E/ A/ W/	(2) Hazardous materials descriptions and proper shipping names	(3) Hazard class	(3A) ID Number	(4) Label(s) required (if not excepted)	(5) Packaging		(6) Maximum net quantity in one package		(7) Water Shipments		
					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
	<i>Nitroglycerin, spirits of. See Spirits of nitroglycerin</i>										
	<i>Nitroguanidine, dry. See High explosive</i>										
	<i>Nitroguanidine nitrate</i>	Forbidden									
	<i>Nitroguanidine, wet with not less than 20% water</i>	Flammable solid	UN1336	Flammable solid	173.153	173.184	25 pounds	100 pounds	1,2	4	
	<i>1-Nitro hydantoin</i>	Forbidden									
E	<i>Nitrohydrochloric acid (RQ-1000/454)</i>	Corrosive material	UN1798	Corrosive	None	173.278	Forbidden	5 pints	1	5	
E	<i>Nitrohydrochloric acid, diluted (RQ-1000/454)</i>	Corrosive material	UN1798	Corrosive	None	173.278	Forbidden	5 pints	1	5	
	<i>Nitro isobutane triol trinitrate</i>	Forbidden									
	<i>Nitromannite. See High explosive</i>										
	<i>Nitromannite (dry)</i>	Forbidden									
	<i>Nitromethane</i>	Flammable liquid	UN1261	Flammable liquid	173.118	173.149a	1 quart	10 gallons	1,2	1,2	
E	<i>Nitromuriatic acid. See Nitro- hydrochloric acid</i>										
	<i>N-Nitro-N-methylglycolamide nitrate</i>	Forbidden									
E	<i>Nitrophenol (RQ-1000/454)</i>	ORM-E	UN1663	None	None	173.510	No limit	No limit	1,2	1,2	
	<i>Nitrophenol pesticide, substi- tuted, liquid or solid, n.o.s. (compounds and preparations). See Substituted nitrophenol pest- icide, liquid or solid, n.o.s. (compounds and preparations)</i>										
	<i>m-Nitrophenyldinitro methane</i>	Forbidden									
	<i>Nitrosoguanidine. See Initiating explosive</i>										
	<i>Nitrostarch, dry. See High explosive</i>										
	<i>Nitrostarch, wet with not less than 30% alcohol or solvent</i>	Flammable liquid	UN1337	Flammable liquid	173.118	173.127	1 quart	25 pounds	1,2	1	
	<i>Nitrostarch, wet with not less than 20% water</i>	Flammable solid	UN1337	Flammable solid	173.153	173.184	25 pounds	100 pounds	1	4	
	<i>Nitrosugars (dry)</i>	Forbidden									
	<i>Nitrosyl chloride</i>	Non- flammable gas	UN1069	Non- flammable gas	173.306	173.304 173.314	Forbidden	300 pounds	1	4	
E	<i>Nitrotoluene (RQ-1000/454)</i>	ORM-E	UN1664	None	None	173.510	No limit	No limit	1,2	1,2	
	<i>Nitrourea. See High explosive</i>										
	<i>Nitrous oxide</i>	Non- flammable gas	UN1070	Non- flammable gas	173.306	173.304 173.315	150 pounds	300 pounds	1,2	1,2	107
+	<i>Nitroxylol</i>	Poison B	NA1665	Poison	173.345	173.346	1 quart	55 gallons	1,2	1	
	<i>Nonflammable gas, n.o.s. See Compressed gas, n.o.s.</i>										
+	<i>Nonliquefied hydrocarbon gas. See Hydrocarbon gas, nonliquefied</i>										

ILLINOIS HAZARDOUS MATERIALS TRANSPORTATION REGULATIONS

§172.101 HAZARDOUS MATERIALS TABLE

(1) +/ E/ A/ W/	(2) Hazardous materials descriptions and proper shipping names	(3) Hazard class	(3A) ID Number	(4) Label(s) required (if not excepted)	(5) Packaging		(6) Maximum net quantity in one package		(7) Water Shipments		
					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
	Nonyltrichlorosilane	Corrosive material	UN1799	Corrosive	None	173.280	Forbidden	10 gallons	1	1	13
E	Nordhausen acid. <i>See</i> Sulfuric acid										
W	Oakum	ORM-C		None	173.505	173.1030			1,2	1,2	
	Octadecyltrichlorosilane	Corrosive material	UN1800	Corrosive	None	173.280	Forbidden	10 gallons	1	1	13
	1,7-Octadiene-3,5-diyne-1,8-dimethoxy-9-octadecynoic acid	Forbidden									
	Octane	Flammable liquid	UN1262	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	n-Octanoyl peroxide, technically pure. <i>See</i> Organic peroxide, liquid or solution, n.o.s.										
	Octyltrichlorosilane	Corrosive material	UN1801	Corrosive	None	173.280	Forbidden	10 gallons	1	1	13
	Oil, described as oil, Oil, n.o.s., Petroleum oil, or Petroleum oil, n.o.s.	Combustible liquid	NA1270	None	173.118a	None	No limit	No limit	1,2	1,2	
	Oil, described as oil, Oil, n.o.s., petroleum oil, or Petroleum oil, n.o.s.	Flammable liquid	NA1270	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	Oiled clothing (manufactured article properly dried to prevent spontaneous heating). <i>See</i> Oiled material										
AW	Oiled material (manufactured article properly dried to prevent spontaneous heating)	ORM-C	NA9053	None	173.505	173.1035	No limit	No limit	1,3	1,3	
	Oiled paper (manufactured article properly dried to prevent spontaneous heating). <i>See</i> Oiled material										
	Oil of mirbane. <i>See</i> Nitrobenzene liquid										
	Oil of vitriol. <i>See</i> Sulfuric acid										
	Oil well cartridge	Class C explosive		Class C explosive	None	173.112	50 pounds	150 pounds	1,3	1,3	
E	Oleum (fuming sulfuric acid) (RQ-1000/454)	Corrosive material	NA1831	Corrosive	None	173.272	Forbidden	5 pints	1,2	1	108
	Organic peroxide, liquid or solution, n.o.s.	Flammable liquid	NA1993	Flammable liquid and Organic peroxide	None	173.119	Forbidden	1 quart	1,2	5	109
	Organic peroxide, liquid or solution, n.o.s.	Organic peroxide	NA9183	Organic peroxide	173.153	173.221	Forbidden	1 quart	1,2	1,2	109
	Organic peroxide, mixture. <i>See</i> Organic peroxide, solid, n.o.s., or Organic peroxide, liquid or solution, n.o.s., as appropriate		UN2756								
	Organic peroxide, sample, n.o.s. <i>See</i> Organic peroxide, solid, n.o.s. or Organic peroxide, liquid or solution, n.o.s., as appropriate		UN2255								
	Organic peroxide, solid, n.o.s.	Organic peroxide	NA9187	Organic peroxide	173.153	173.154	Forbidden	25 pounds	1,2	1,2	109

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§172.101 HAZARDOUS MATERIALS TABLE

(1) +/ E/ A/ W/	(2) Hazardous materials descriptions and proper shipping names	(3) Hazard class	(3A) ID Number	(4) Label(s) required (if not excepted)	(5) Packaging		(6) Maximum net quantity in one package		(7) Water Shipments		
					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
	Organic peroxide, trial quantity, n.o.s. <i>See</i> Organic peroxide, solid, n.o.s. <i>or</i> Organic peroxide, liquid <i>or</i> solution, n.o.s., <i>as appropriate</i>		UN2899								
	Organic phosphate mixture, Organic phosphate compound mixture, <i>or</i> Organic phosphorus compound mixture; liquid	Poison B	NA2783	Poison	173.359	173.359	1/2 pint	1 quart	1,2	5	
	Organic phosphate mixture, Organic phosphate compound mixture, <i>or</i> Organic phosphorus compound mixture; solid <i>or</i> dry	Poison B	NA2783	Poison	173.377	173.377	50 pounds	200 pounds	1,2	4	
	Organic phosphate, Organic phosphate compound, <i>or</i> Organic phosphorus compound; mixed with compressed gas	Poison A	NA1955	Poison gas	None	173.334	Forbidden	Forbidden	1	5	4
	Organic phosphate, Organic phosphate compound, <i>or</i> Organic phosphorus compound; liquid	Poison B	NA2783	Poison	None	173.358	Forbidden	1 quart	1,2	5	
	Organic phosphate, Organic phosphate compound, <i>or</i> Organic phosphorus compound; solid <i>or</i> dry	Poison B	NA2783	Poison	None	173.377	Forbidden	200 pounds	1,2	4	
	Organochlorine pesticide, liquid, n.o.s. (<i>compounds and preparations</i>),	Flammable liquid	UN2762	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	Organochlorine pesticide, liquid, n.o.s. (<i>compounds and preparations</i>),	Poison B	UN2761	Poison	173.345	173.346	1 quart	55 gallons	1,2	1,2	
	Organochlorine pesticide, solid, n.o.s. (<i>compounds and preparations</i>),	Poison B	UN2761	Poison	173.364	173.365	50 pounds	200 pounds	1,2	1,2	
	Organophosphorus pesticide, liquid, n.o.s. (<i>compounds and preparations</i>),	Flammable liquid	UN2784	Flammable liquid	None	173.119	Forbidden	1 quart	1,2	5	
	Organophosphorus pesticide, liquid, n.o.s. (<i>compounds and preparations</i>),	Poison B	UN2783	Poison	173.359	173.359	Forbidden	1 quart	1,2	5	
	Organophosphorus pesticide, solid, n.o.s. (<i>compounds and preparations</i>),	Poison B	UN2783	Poison	173.377	173.377	Forbidden	200 pounds	1,2	4	
	Organotin pesticide, solid, n.o.s. (<i>compounds and preparations</i>),	Flammable liquid	UN2787	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	Organotin pesticide, liquid, n.o.s. (<i>compounds and preparations</i>),	Poison B	UN2786	Poison	173.345	173.346	1 quart	55 gallons	1,2	1,2	
	Organotin pesticide, solid, n.o.s. (<i>compounds and preparations</i>),	Poison B	UN2786	Poison	173.364	173.365	50 pounds	200 pounds	1,2	1,2	
A	ORM-A, n.o.s.	ORM-A	NA1693	None	173.505	173.510	No limit	No limit			
A	ORM-B, n.o.s.	ORM-B	NA1760	None	173.505	173.510	No limit	No limit			
	ORM-C. <i>See</i> 173.500 and 176.900										
	Orthonitroaniline. <i>See</i> Nitroaniline										
	Oxidizer, corrosive, liquid, n.o.s.	Oxidizer	NA9193	Oxidizer and Corrosive	None	173.245	Forbidden	1 quart	1	5	

ILLINOIS HAZARDOUS MATERIALS TRANSPORTATION REGULATIONS

§172.101 HAZARDOUS MATERIALS TABLE

(1) +/ E/ A/ W/	(2) Hazardous materials descriptions and proper shipping names	(3) Hazard class	(3A) ID Number	(4) Label(s) required (if not excepted)	(5) Packaging		(6) Maximum net quantity in one package		(7) Water Shipments		
					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
	Oxidizer, corrosive, solid, n.o.s. <i>Oxidizer material packed with other articles. See 173.152</i>	Oxidizer	NA9194	Oxidizer and Corrosive	173.153	173.154	25 pounds	25 pounds	1	4	
	Oxidizer, n.o.s., or Oxidizing material, n.o.s.	Oxidizer	UN1479	Oxidizer	173.153	173.154	25 pounds	25 pounds	1,2	1,2	
	Oxidizer, poisonous, liquid, n.o.s.	Oxidizer	NA9199	Oxidizer and Poison	None	173.154	Forbidden	1 quart	1	5	
	Oxidizer, poisonous solid, n.o.s.	Oxidizer	NA9200	Oxidizer and Poison	173.153	173.154	25 pounds	25 pounds	1,2	4	
	Oxygen	Non- flammable gas	UN1072	Oxidizer	173.306	173.302 173.314	150 pounds	300 pounds	1,2	1,2	107
	Oxygen, pressurized liquid	Non- flammable gas	UN1073	Oxidizer	None	173.304	Forbidden	Forbidden	1,3	1,3	110
	Paint drier, liquid	Combust- ible liquid	UN1168	None	173.118a	None	No limit	No limit	1,2	1,2	
	Paint drier, liquid	Flammable liquid	UN1168	Flammable liquid	173.118	173.128	1 quart	55 gallons	1,2	1	
	Paint, Enamel, Lacquer, Stain, Shellac, or Varnish, Aluminum, Bronze, Gold, Wood filler, liquid or Lacquer base, liquid	Combust- ible liquid	UN1263	None	173.118a	None	No limit	No limit	1,2	1,2	
	Paint, Enamel, Lacquer, Stain, Shellac, or Varnish, Aluminum, Bronze, Gold, Wood filler, liquid or Lacquer base, liquid	Flammable liquid	UN1263	Flammable liquid	173.118	173.128	1 quart	55 gallons	1,2	1	
	<i>Paint, reducing or thinning compound. See Compound, lacquer, paint, or varnish, removing, reducing or thinning liquid</i>										
	<i>Paper caps. See Toy caps</i>										
W	Paper scrap (when dry, clean, and free from oil). See	ORM-C		None	173.505	173.1075			1,2	1,2	
	Paper stock, wet	Flammable solid	NA1325	Flammable solid	None	173.185	Forbidden	Forbidden	1,2	1,2	29
	Paper waste, wet (when dry, clean, and free from oil). See Paper scrap										
	Paper waste, wet. See Waste Paper, wet										
EAW	Paraformaldehyde (RQ-1000/454)	ORM-A	UN2213	None	173.505	173.510	25 pounds	200 pounds	2	2	
	Paraldehyde	Flammable liquid	UN1264	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	Paramethane hydroperoxide	Organic peroxide	UN2125	Organic peroxide	173.153	173.224	1 quart	1 quart	1,2	4	
	Paranitroaniline, solid. See Nitroaniline										
E	Parathion and compressed gas mixture (RQ-1/0.454)	Poison A	NA1967	Poison gas	None	173.334	Forbidden	Forbidden	1,3	5	
E	Parathion, liquid (RQ-1/0.454)	Poison B	NA2783	Poison	None	173.358	Forbidden	1 quart	1,3	1,3	

ILLINOIS HAZARDOUS MATERIALS TRANSPORTATION REGULATIONS

§172.101 HAZARDOUS MATERIALS TABLE

(1) +/ E/ A/ W/	(2) Hazardous materials descriptions and proper shipping names	(3) Hazard class	(3A) ID Number	(4) Label(s) required (if not excepted)	(5) Packaging		(6) Maximum net quantity in one package		(7) Water Shipments		
					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
E	Parathion mixture, dry (RQ-1/0.454)	Poison B	NA2783	Poison	173.377	173.377	50 pounds	200 pounds	1,3	1,3	
E	Parathion mixture, liquid (RQ-1/0.454)	Poison B	NA2783	Poison	None	173.359	Forbidden	1 quart	1,3	1,3	
E	Paris green, solid. See Copper acetoarsenite, solid										
E	PCB. See Polychlorinated biphenyls										
	Pelargonyl peroxide, technically pure. See Organic peroxide, solid, n.o.s.		UN2130								
	Pentaborane	Flammable liquid	UN1380	Flammable liquid and Poison	None	173.138	Forbidden	Forbidden	1	5	63
E	Pentachlorophenol (RQ-10/4.54)	ORM-E	NA2020	None	None	173.510	No limit	No limit	1,2	1,2	
	Pentaerythrite tetrinitrate. See Initiating explosive										
	Pentaerythrite tetrinitrate, desensitized, wet. See High explosive										
	Pentaerythrite tetrinitrate (dry)	Forbidden									
	Pentane	Flammable liquid	UN1265	Flammable liquid	173.118	173.119	Forbidden	10 gallons	1,3	4	
	Pentanitroaniline (dry)	Forbidden									
	Pentolite, dry. See High explosive										
	Peracetic acid solution, not over 43% peracetic acid and not over 6% hydrogen peroxide	Organic peroxide	NA2131	Organic peroxide	173.223	173.223	1 pint	5 pints	1	4	4
	Perchlorate, n.o.s.	Oxidizer	NA1481	Oxidizer	173.153	173.154	25 pounds	100 pounds	1,3	1,3	21
	Perchloric acid, exceeding 50% but not exceeding 72% strength	Oxidizer	UN1873	Oxidizer	None	173.269	Forbidden	5 pints	1	5	111
	Perchloric acid exceeding 72% strength	Forbidden									
	Perchloric acid, not over 50% acid	Oxidizer	UN1802	Oxidizer	173.244	173.269	Forbidden	5 pints	1	1	111
+	Perchloromethyl mercaptan	Poison B	UN1670	Poison	173.345	173.360	Forbidden	10 pounds	1	4	
	Percussion cap	Class C explosive		None	None	173.107	50 pounds	150 pounds	1,3	1,3	
	Percussion fuze	Class C explosive		Explosive C	None	173.105	50 pounds	150 pounds	1,3	1,3	
A	Perfluoro-2-butene	ORM-A	NA2422	None	173.505	173.605	10 gallons	55 gallons			
	Permanganate, n.o.s.	Oxidizer	NA1482	Oxidizer	173.153	173.154	25 pounds	100 pounds	1,2	1,2	112
E	Potassium permanganate See Potassium permanganate Peroxide, organic. See Organic Peroxide										

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§172.101 HAZARDOUS MATERIALS TABLE

(1) +/ E/ A/ W/	(2) Hazardous materials descriptions and proper shipping names	(3) Hazard class	(3A) ID Number	(4) Label(s) required (if not excepted)	(5) Packaging		(6) Maximum net quantity in one package		(7) Water Shipments		
					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
	Peroxyacetic acid not more than 43% and with not more than 6% hydrogen peroxide. See peracetic acid solution, not over 43% peracetic acid and not over 6% hydrogen peroxide.	Forbidden	UN2131								
W	Pesticide, water reactive, including but not limited to fungicides, and herbicides, etc., which contain manganese ethylene-bisdiithiocarbamate	ORM-C	NA2210	None	173.505	173.1040			2	2	13
W	Petroleum coke (uncalcined) Petroleum crude. See Crude oil	ORM-C		None	173.505	173.1045			1,2	1,2	113
	Petroleum distillate	Combustible liquid	UN1268	None	173.118	None	No limit	No limit	1,2	1,2	
	Petroleum distillate	Flammable liquid	UN1268	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,3	4	
	Petroleum ether	Flammable liquid	UN1271	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,3	4	
	Petroleum gas, liquefied. See Liquefied petroleum gas										
	Petroleum naphtha	Combustible liquid	UN1255	None	173.118	None	No limit	No limit	1,2	1,2	
	Petroleum naphtha	Flammable liquid	UN1255	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
A	Phenacpton	ORM-A	NA2783	None	173.505	173.510	No limit	No limit			
+E	Phenol (RQ-1000/454)	Poison B	UN1671	Poison	173.364	173.369	50 pounds	250 pounds	1,2	1,2	
E	Phenol, liquid, or solution (liquid tar acid containing over 50% phenol) (RQ-1000/454)	Poison B	NA2821	Poison	173.345	173.349	1 quart	55 gallons	1,2	1,2	
	Phenoxy pesticide, liquid, n.o.s. (compounds and preparations),	Flammable liquid	UN2766	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	Phenoxy pesticide, liquid, n.o.s. (compounds and preparations),	Poison B	UN2765	Poison	173.345	173.346	1 quart	55 gallons	1,2	1,2	
	Phenoxy pesticide, solid, n.o.s. (compounds and preparations),	Poison B	UN2765	Poison	173.364	173.365	50 pounds	200 pounds	1,2	1,2	
A	Phenylenediamine, meta or para, solid	ORM-A	UN1673	None	173.505	173.510	No limit	No limit			
	Phenyldichloroarsine	Poison B	NA1556	Poison	None	173.355	Forbidden	30 gallons	1	5	
	m-Phenylene diaminediperchlorate (dry)	Forbidden									
	Phenyltrichlorosilane Phenyl trichlorosilane	Corrosive material	UN1804	Corrosive	None	173.280	Forbidden	10 gallons	1	1	13
	Phenylurea pesticide, liquid, n.o.s. (compounds and preparations),	Flammable liquid	UN2768	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	Phenylurea pesticide, liquid, n.o.s. (compounds and preparations),	Poison B	UN2767	Poison	173.345	173.346	1 quart	55 gallons	1,2	1,2	

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(1) +/ E/ A/ W/	(2) Hazardous materials descriptions and proper shipping names	(3) Hazard class	(3A) ID Number	(4) Label(s) required (if not excepted)	(5) Packaging		(6) Maximum net quantity in one package		(7) Water Shipments		
					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
	Phenylurea pesticide, solid, n.o.s. (compounds and preparations),	Poison B	UN2767	Poison	173.364	173.365	50 pounds	200 pounds	1,2	1,2	
E	Phosgene (diphosgene) (RQ-5000/2270)	Poison A	UN1076	Poison gas	None	173.333	Forbidden	Forbidden	1	5	72
	Phosphine	Poison A	UN2199	Poison gas and Flammable gas	None	173.328	Forbidden	Forbidden	1	5	
E	Phosphoric acid (RQ-5000/2270)	Corrosive material	UN1805	Corrosive	173.244	173.245	1 quart	10 gallons	1,2	1,2	7
	Phosphoric acid triethyleneimine. See Tris-(1-aziridyl) phosphine oxide										
	Phosphoric anhydride (phosphorus pentoxide)	Corrosive material	NA1807	Corrosive	None	173.188	Forbidden	100 pounds	1,2	1,2	114
E	Phosphorus, amorphous, red (RQ-1/0.454)	Flammable solid	UN1338	Flammable solid	None	173.189	Forbidden	11 pounds	1,2	1,2	
	Phosphorus bromide. See Phosphorus tribromide										
E	Phosphorus chloride. See Phosphorus trichloride										
	Phosphorus heptasulfide	Flammable solid	UN1339	Flammable solid	None	173.225	Forbidden	10 pounds	1,2	1	115
	Phosphorus oxybromide	Corrosive material	UN1939	Corrosive	None	173.271	Forbidden	1 quart	1	1	5
E	Phosphorus oxychloride (RQ-5000/2270)	Corrosive material	UN1810	Corrosive	None	173.271	Forbidden	1 quart	1	1	5
	Phosphorus pentachloride, solid	Corrosive material	UN1806	Corrosive	None	173.191	Forbidden	5 pounds	1	1	13
E	Phosphorus pentasulfide (RQ-1000/454)	Flammable solid	UN1340	Flammable solid and Dangerous when wet	None	173.225	Forbidden	11 pounds	1,2	1,2	115
	Phosphorus sesquisulfide	Flammable solid	UN1341	Flammable solid and Dangerous when wet	None	173.225	Forbidden	11 pounds	1,2	1	115
	Phosphorus tribromide	Corrosive material	UN1808	Corrosive	None	173.270	Forbidden	1 quart	1	1	5
E	Phosphorus trichloride (RQ-5000/2270)	Corrosive material	UN1809	Corrosive	None	173.271	Forbidden	1 quart	1,2	1	5
	Phosphorus trisulfide	Flammable solid	UN1343	Flammable solid	None	173.225	Forbidden	10 pounds	1,2	1	115
E	Phosphorus, white or yellow, dry (RQ-1/0.454)	Flammable solid	UN1381	Flammable solid and Poison	None	173.190	Forbidden	Forbidden	1,2	5	29
E	Phosphorus, white or yellow, in water (RQ-1/0.454)	Flammable solid	UN1381	Flammable solid and Poison	None	173.190	Forbidden	25 pounds	1,2	5	29
	Phosphorus (white or red) and a chlorate, mixtures of	Forbidden									
E	Phosphoryl chloride. See Phosphorus oxychloride										
	Photographic film. See Film										
	Photographic flash powder. See Fireworks, special or Low explosives										

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(1) +/ E/ A/ W/	(2) Hazardous materials descriptions and proper shipping names	(3) Hazard class	(3A) ID Number	(4) Label(s) required (if not excepted)	(5) Packaging		(6) Maximum net quantity in one package		(7) Water Shipments		
					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
	Phthalimide derivative pesticide, liquid, n.o.s. (compounds and preparations),	Flammable liquid	UN2774	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	Phthalimide derivative pesticide, liquid, n.o.s. (compounds and preparations),	Poison B	UN2773	Poison	173.345	173.346	1 quart	55 gallons	1,2	1,2	
	Phthalimide derivative pesticide, solid, n.o.s. (compounds and preparations),	Poison B	UN2773	Poison	173.364	173.365	50 pounds	200 pounds	1,2	1,2	
	Picrate, dry. See High explosive										
	Picrate of ammonia. See High explosive										
	Picric acid, dry. See High explosive										
	Picric acid, wet, with not less than 10% water	Flammable solid	NA1344	Flammable solid	173.192	173.193	1 pound	25 pounds	1	5	116
	Picric acid, wet with not less than 10% water, over 25 pounds. See High explosive										
	Pinane hydroperoxide, technically pure. See Organic peroxide, liquid or solution, n.o.s.		UN2162								
	Pinane hydroperoxide solution not over 45% peroxide	Organic peroxide	UN2162	Organic peroxide	173.153	173.224	1 quart	1 quart	1,2	4	
	Pinene	Flammable liquid	UN2368	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	Pine oil	Combustible liquid	UN1272	None	173.118a	None	No limit	No limit	1,2	1,2	
	Pinwheels. See Fireworks, common										
	Pivaloyl chloride. See Trimethylacetyl chloride										
	Plastic solvent, n.o.s.	Combustible liquid	NA1993	None	173.118a	None	No limit	No limit	1,2	1,2	
	Plastic solvent, n.o.s.	Flammable liquid	NA1993	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	Plutonium nitrate, solution	Radioactive material	NA9185	Radioactive (See 172.403)	173.393	173.396			1,2	1,2	
	Poisonous liquid or gas, flammable, n.o.s.	Poison A	NA1953	Poison gas and Flammable gas	None	173.328	Forbidden	Forbidden	1	5	72
	Poisonous liquid or gas, n.o.s.	Poison A	NA1955	Poison gas	None	173.328	Forbidden	Forbidden	1	5	
	Poisonous liquid, n.o.s. or Poison B, liquid, n.o.s.	Poison B	UN2810	Poison	173.345	173.346	1 quart	55 gallons	1,2	1	
	Poisonous solid, corrosive, n.o.s.	Poison B	UN2928	Poison and Corrosive	173.364	173.365	25 pounds	100 pounds	1	4	
	Poisonous solid, n.o.s. or Poison B, solid, n.o.s.	Poison B	UN2811	Poison	173.364	173.365	50 pounds	200 pounds	1,2	1	
	Polish, metal, stove, furniture or wood, liquid	Combustible liquid	NA1142	None	173.118a	None	No limit	No limit	1,2	1,2	
	Polish, metal, stove, furniture or wood, liquid	Flammable liquid	NA1142	Flammable liquid	173.118	173.129	1 quart	55 gallons	1,2	1	

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§172.101 HAZARDOUS MATERIALS TABLE

(1) +/ E/ A/ W/	(2) Hazardous materials descriptions and proper shipping names	(3) Hazard class	(3A) ID Number	(4) Label(s) required (if not excepted)	(5) Packaging		(6) Maximum net quantity in one package		(7) Water Shipments		
					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
E	Polychlorinated biphenyls (RQ-10/4.54) Polymerizable material. See 173.21	ORM-E	UN2315	None	None	173.510	No limit	No limit	1,2	1,2	45
E	Potassium arsenate, solid (RQ-1000/454)	Poison B	UN1677	Poison	173.364	173.365	50 pounds	200 pounds	1,2	1,2	
E	Potassium arsenite, solid (RQ-1000/454) Potassium bifluoride solution. See Potassium hydrogen fluoride solution	Poison B	UN1678	Poison	173.364	173.365	50 pounds	200 pounds	1,2	1,2	
	Potassium bromate	Oxidizer	UN1484	Oxidizer	173.153	173.154	25 pounds	100 pounds	1,2	1,2	31
	Potassium carbonyl	Forbidden									
	Potassium chlorate (potash chlorate)	Oxidizer	UN1485	Oxidizer	173.153	173.163	25 pounds	100 pounds	1,2	1,2	31
E	Potassium chromate (RQ-1000/454)	ORM-E	NA9142	None	None	173.510	No limit	No limit	1,2	1,2	
E	Potassium cyanide, solid (RQ-10/4.54)	Poison B	UN1680	Poison	173.370	173.370	25 pounds	200 pounds	1,2	1,2	32
E	Potassium cyanide solution (RQ-10/4.54) Potassium dichloro isocyanurate. See Potassium dichloro-s- triazinetriene	Poison B	UN1680	Poison	173.345	173.352	1 quart	55 gallons	1,2	1,2	32
	Potassium dichloro-s- triazinetriene, dry (containing more than 39% available chlorine)	Oxidizer	NA2465	Oxidizer	173.153	173.217	50 pounds	100 pounds	1,2	1,2	
EA	Potassium dichromate (RQ-1000/454)	ORM-A	NA1479	None	173.505	173.510	No limit	No limit	1,2	1,2	
A	Potassium fluoride	ORM-B	UN1812	None	173.505	173.510	No limit	No limit			
	Potassium fluoride solution	Corrosive material	UN1812	Corrosive	173.244	173.249	1 quart	5 gallons	1,2	1,2	
E	Potassium hydrate. See Potassium hydroxide										
	Potassium hydrogen fluoride solution	Corrosive material	NA1811	Corrosive	173.244	173.249	1 quart	5 gallons	1,2	1,2	
A	Potassium hydrogen sulfate, solid	ORM-B	UN2509	None	173.505	173.800	25 pounds	100 pounds			
E	Potassium hydroxide, dry solid, flake, bead, or granular (RQ-1000/454)	Corrosive material	UN1813	Corrosive	173.244	173.245b	25 pounds	100 pounds	1,2	1,2	117
E	Potassium hydroxide, liquid or solution (RQ-1000/454) Potassium hypochlorite solution. See Hypochlorite solutions con- taining more than 7% available chlorine by weight	Corrosive material	UN1814	Corrosive	173.244	173.249	1 quart	10 gallons	1,2	1,2	
A	Potassium metabisulfite	ORM-B	NA2693	None	173.505	173.510	No limit	No limit			
	Potassium, metal or metallic solid	Flammable solid	UN2257	Flammable solid and Dangerous when wet	None	173.206	Forbidden	25 pounds	1,2	5	14
	Potassium, metal, liquid alloy	Flammable solid	UN1420	Flammable solid and Dangerous when wet	None	173.202	Forbidden	1 pound	1,2	5	14

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					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
	Potassium nitrate	Oxidizer	UN1486	Oxidizer	173.153	173.182	25 pounds	100 pounds	1,2	1,2	
E	Potassium nitrate mixed (<i>fused</i>) with sodium nitrite. <i>See</i> Sodium nitrite mixed (<i>fused</i>) with potassium nitrate										
	Potassium nitrite	Oxidizer	UN1488	Oxidizer	173.153	173.154	25 pounds	100 pounds	1,2	1,2	118
	Potassium perchlorate	Oxidizer	UN1489	Oxidizer	173.153	173.219	25 pounds	100 pounds	1,3	1,3	21
E	Potassium permanganate (RQ-100/45.4)	Oxidizer	UN1490	Oxidizer	173.153	173.154 173.194	25 pounds	100 pounds	1,2	1,2	33
	Potassium peroxide	Oxidizer	UN1491	Oxidizer	None	173.154	Forbidden	100 pounds	1,2	1,2	13
	Potassium sulfide	Flammable solid	UN1382	Flammable solid	173.153	173.207	25 pounds	300 pounds	1,2	1,2	119
	<i>Pressurized product. See</i> <i>Compressed gas, n.o.s.</i>										
	<i>Primer. See</i> Cannon primer, <i>Combination primer, or</i> Small-arms <i>primer</i>										
	<i>Primer, detonating. See</i> Detona- <i>ting primers, Class A or Class C</i> <i>explosives</i>										
	<i>Projectile, explosive. See</i> <i>Explosive projectile</i>										
	<i>Projectile, gas, nonexplosive.</i> <i>See</i> Chemical ammunition, non- <i>explosive (containing a Poison A,</i> <i>Poison B or irritating material,</i> <i>as appropriate)</i>										
	<i>Projectile, gas, smoke, or incen-</i> <i>diary, with burster or booster</i> <i>with or without detonating fuze.</i> <i>See</i> Explosive projectile										
	<i>Projectile, illuminating,</i> <i>incendiary or smoke, with expel-</i> <i>ling charge but without bursting</i> <i>charge. See</i> Fireworks, special										
	<i>Projectile, sand-loaded, empty or</i> <i>solid. See</i> 173.55										
	Propane or Liquefied petroleum gas. <i>See</i> Liquefied petroleum gas										
E	Propargite (RQ-10/4.54)	ORM-E	NA2765	None	None	173.510	No limit	No limit	1,2	1,2	
	Propargyl alcohol	Flammable liquid	NA1986	Flammable liquid and Poison	None	173.119	Forbidden	1 quart	1,2	5	
	Propellant explosive	Class A explosive		Explosive A	None	173.64	Forbidden	Forbidden	6	5	
	Propellant explosive in water (<i>smokeless powder</i>)	Class B explosive		Explosive B	None	173.93	Forbidden	Forbidden	1,3	5	120
	Propellant explosive in water, unstable, condemned, or deter- iorated (<i>smokeless powder</i>)	Class B explosive		Explosive B	None	173.93	Forbidden	Forbidden	1,3	5	120
	Propellant explosive, liquid	Class B explosive		Explosive B	None	173.93	Forbidden	10 pounds	1,2	5	120
	Propellant explosive, solid	Class B explosive		Explosive B	None	173.93	Forbidden	10 pounds	1,3	5	120

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(1) +/ E/ A/ W/	(2) Hazardous materials descriptions and proper shipping names	(3) Hazard class	(3A) ID Number	(4) Label(s) required (if not excepted)	(5) Packaging		(6) Maximum net quantity in one package		(7) Water Shipments		
					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
	Propionaldehyde	Flammable liquid	UN1275	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
E	Propionic acid (RQ-5000/2270)	Corrosive material	UN1848	Corrosive	173.244	173.245	1 quart	5 gallons	1,2	1,2	121
E	Propionic acid solution (RQ-5000/2270)	Corrosive material	UN1848	Corrosive	173.244	173.245	1 quart	10 gallons	1,2	1,2	121
E	Propionic anhydride (RQ-5000/2270)	Corrosive material	UN2496	Corrosive	173.244	173.245	1 quart	1 quart	1,2	1	13
	Propionyl peroxide, not more than 28% in solution. See Organic peroxide, liquid or solution, n.o.s.		UN2132								
	Propionyl peroxide, more than 28% in solution	Forbidden									
	Propyl acetate	Flammable liquid	UN1276	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	Propyl alcohol	Flammable liquid	UN1274	Flammable liquid	173.118	173.125	1 quart	10 gallons	1,2	1,2	
	Propylamine	Flammable liquid	UN1277	Flammable liquid	None	173.119	Forbidden	10 gallons	1,3	5	
	Propyl chloride	Flammable liquid	UN1278	Flammable liquid	None	173.119	Forbidden	10 gallons	1,3	5	
	Propylene or Liquefied petroleum gas. See Liquefied petroleum gas										
	Propylenediamine	Flammable liquid	UN2258	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
E	Propylene dichloride (RQ-5000/2270)	Flammable liquid	UN1279	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	Propyleneimine, inhibited	Flammable liquid	UN1921	Flammable liquid	None	173.139	Forbidden	5 pints	1,2	1	
E	Propylene oxide (RQ-5000/2270)	Flammable liquid	UN1280	Flammable liquid	173.118	173.119	Forbidden	1 gallon	1,3	4	
	Propyl formate	Flammable liquid	UN1281	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	Propyl mercaptan	Flammable liquid	UN2704	Flammable liquid	None	173.141	Forbidden	10 gallons	1,2	5	
	Propyl trichlorosilane	Corrosive material	UN1816	Corrosive	None	173.280	Forbidden	10 gallons	1	1	13
	Prussic acid. See Hydrocyanic acid, as appropriate										
E	Pyrethrins (RQ-1000/454)	ORM-E	NA9184	None	None	173.510	No limit	No limit	1,2	1,2	
	Pyridine	Flammable liquid	UN1282	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	Pyridine perchlorate	Forbidden									
	Pyrophoric liquid, n.o.s. or Pyroforic liquid, n.o.s.	Flammable liquid	UN2845	Flammable liquid	None	173.134	Forbidden	Forbidden	1	5	122
	Pyrosulfuryl chloride	Corrosive material	UN1817	Corrosive	173.244	173.247	1 quart	1 quart	1	4	5
	Pyroxylin plastic scrap	Flammable solid	NA2006	Flammable solid	None	173.195	Forbidden	Forbidden	1	5	4
	Pyroxylin plastics, rods, sheets, rolls, or tubes	Flammable solid	NA2006	Flammable solid	173.197	173.197	50 pounds	350 pounds	1,3	1	

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(1) +/ E/ A/ W/	(2) Hazardous materials descriptions and proper shipping names	(3) Hazard class	(3A) ID Number	(4) Label(s) required (if not excepted)	(5) Packaging		(6) Maximum net quantity in one package		(7) Water Shipments		
					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
	Pyroxylin solution	Combustible liquid	NA2059	None	173.118	None	No limit	No limit	1,2	1,2	
	Pyroxylin solution	Flammable liquid	NA2059	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	Pyroxylin solvent, n.o.s.	Combustible liquid	NA2059	None	173.118	None	No limit	No limit	1,2	1,2	
	Pyroxylin solvent, n.o.s.	Flammable liquid	NA2059	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	Pyrrolidine	Flammable liquid	UN1922	Flammable liquid	173.118	173.119	Forbidden	10 gallons	1,2	1	
	Quebrachitol pentanitrate	Forbidden									
	Quicklime. See Calcium oxide										
E	Quinoline (RQ-1000/454)	ORM-E	UN2656	None	None	173.510	No limit	No limit	1,2	1,2	
	Radioactive device, n.o.s.	Radioactive material	UN2911	None	173.391				1,2	1,2	
	Radioactive material, fissile, n.o.s.	Radioactive material	UN2918	Radioactive	173.393	173.396			1,2	1,2	
	Radioactive material, limited quantity, n.o.s.	Radioactive material	UN2910	None	173.391				1,2	1,2	
	Radioactive material, low specific activity or LSA, n.o.s.	Radioactive material	UN2912	Radioactive	173.392	173.393			1,2	1,2	
	Radioactive material, n.o.s.	Radioactive material	NA9181	Radioactive	173.393	173.395			1,2	1,2	
	Radioactive material, special form, n.o.s.	Radioactive material	NA9182	Radioactive	173.393	173.394			1,2	1,2	
	Rags, oily	Flammable solid	UN1856	Flammable solid	None	173.199	Forbidden	Forbidden	1,2	1,2	123
	Rags, wet	Flammable solid	NA1325	Flammable solid	None	173.200	Forbidden	Forbidden	1	1	29
	Railway fuses. See Fusee										
	Railway torpedo. See Torpedo, railway										
	Range oil. See Fuel oil										
	Reducing compound, paint varnish, lacquer, etc. See Compound, lacquer, paint or varnish, removing, reducing, or thinning, liquid										
	Refrigerant gas. See Dispersant gas										
	Refrigerating machine	Non-flammable gas	UN2857	Non-flammable gas	173.306 173.307		No limit	No limit	1,3	1,3	
	Refrigerating machine	Flammable gas	NA1954	Flammable gas	173.306		No limit	No limit	1,3	1,3	
	Refrigerating machine	Flammable liquid	NA1993	Flammable liquid	173.130 173.306		No limit	No limit	1,2	1	

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					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
	<i>Removing compound, paint, varnish, lacquer, etc. See Compound, lacquer, paint, or varnish, removing, reducing, or thinning, liquid</i>										
	Resin solution (<i>resin compound, liquid</i>)	Combustible liquid	UN2868	None	173.118a	None	No limit	No limit	1.2	1,2	
	Resin solution (<i>resin compound, liquid</i>)	Flammable liquid	UN1866	Flammable liquid	173.118	173.119	1 quart	55 gallons	1.2	1	
E	Resorcinol (RQ-5000/2270)	ORM-E	UN2876	None	None	173.510	No limit	No limit	1,2	1,2	
	<i>Rifle grenade. See Grenade, hand or rifle, explosive</i>										
	<i>Rifle powder. See Propellant explosive or Black powder</i>										
	<i>Road asphalt or tar, liquid. See Asphalt, cut back</i>										
	<i>Road asphalt or tar (when heated to or above its flash point). See Asphalt</i>										
	Road oil	Combustible liquid	NA1268	None	173.118a	None	No limit	No limit	1,2	1,2	
	Rocket ammunition with empty projectile	Class B explosive		Explosive B	None	173.90	Forbidden	Forbidden	1,3	5	
	Rocket ammunition with explosive projectile	Class A explosive		Explosive A	None	173.57	Forbidden	Forbidden	6	5	
	Rocket ammunition with gas projectile	Class A explosive		Explosive A	None	173.57	Forbidden	Forbidden	6	5	
	Rocket ammunition with illuminating projectile	Class A explosive		Explosive A	None	173.57	Forbidden	Forbidden	6	5	
	Rocket ammunition with incendiary projectile	Class A explosive		Explosive A	None	173.57	Forbidden	Forbidden	6	5	
	Rocket ammunition with inert loaded projectile	Class B explosive		Explosive B	None	173.90	Forbidden	Forbidden	1,3	5	
	Rocket ammunition with smoke projectile	Class A explosive		Explosive A	None	173.57	Forbidden	Forbidden	6	5	
	Rocket ammunition with solid projectile	Class B explosive		Explosive B	None	173.90	Forbidden	Forbidden	1,3	5	
	<i>Rocket body, with electric primer or electric squib. See 173.55</i>										
	Rocket engine, liquid	Class B explosive		Explosive B	None	173.95	Forbidden	Forbidden	1,2	5	120
	<i>Rocket fireworks. See Fireworks, common</i>										
	<i>Rocket head. See Explosive projectile</i>										
	Rocket motor	Class A explosive		Explosive A	None	173.79	Forbidden	Forbidden	6	5	
	Rocket motor	Class B explosive		Explosive B	None	173.92	Forbidden	550 pounds	1,3	5	
	<i>Roman candle. See Fireworks, common</i>										
W	Rosin (<i>colophony</i>) or Resin	ORM-C		None	173.505	173.1060			1,2	1,2	

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					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
	Rough ammoniate tankage (7% or more moisture content)	Flammable solid	NA1325	Flammable solid	None	173.210	Forbidden	Forbidden	1,2	1,2	124
	Rough ammoniate tankage (Less than 7% moisture content)	Flammable solid	NA1325	Flammable solid	None	173.210	Forbidden	Forbidden	1	5	
W	Rubber curing compound (solid)	ORM-C		None	173.505	173.1065			1,2	1,2	
	Rubber scrap or rubber buffings	Flammable solid	UN1345	Flammable solid	173.153	173.201	10 pounds	10 pounds	1,2	1,2	
	Rubber shoddy or Rubber, regenerated or Rubber, reclaimed	Flammable solid	UN1345	Flammable solid	173.153	173.201	10 pounds	10 pounds	1,2	1,2	
	Rubidium metal	Flammable solid	UN1423	Flammable solid and Dangerous when wet	None	173.206	Forbidden	225 pounds	1,2	5	14
	Rubidium metal, in cartridges	Flammable solid	UN1423	Flammable solid and Dangerous when wet	173.206		1 pound	25 pounds	1,2	4	14
	Rum, denatured	Flammable liquid	NA1986	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	Rust preventive coating	Combustible liquid	NA1142	None	173.118a	None	No limit	No limit	1,2	1,2	
	Safety fuse. See Fuse, safety										
	Safety squib	Class C explosive		Explosive C	None	173.106	50 pounds	150 pounds	1,3	1,3	
	Salute. See Fireworks common or special										
	Sand acid. See Hydrofluoro-silicic acid										
W	Sawdust (when dry, clean, and free from oil)	ORM-C		None	173.505	173.1070			1,2	1,2	13
	Selenic acid, liquid	Corrosive material	UN1905	Corrosive	None	173.245	Forbidden	5 pints	1,2	1,2	
	Selenium nitride	Forbidden									
E	Selenium oxide (RQ-1000/454)	Poison B	NA2811	Poison	173.364	173.365	50 pounds	200 pounds	1,2	1,2	
	Self-lighting cigarette	Flammable solid	UN1867	Flammable solid	173.21		Forbidden	Forbidden	1,2	1,2	13
	Self propelled vehicle. See Motor vehicle										
	Shaped charge, commercial. See High explosive (173.55(h))										
	Shaped charges (commercial) containing more than 8 ounces of explosives	Forbidden									
	Shellac. See Paint, Enamel, Lacquer, Stain, Shellac, Varnish; etc.										
	Shell, fireworks. See Fireworks, common or special										
	Ship, distress signal. See Fire-works, special										
	Signal flare	Class C explosive		Explosive C	None	173.108	50 pounds	200 pounds	1,2	1,2	

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					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
	Silicofluoric acid. <i>See</i> Hydrofluorosilicic acid										
	Silicon chloride or silicon tetrachloride	Corrosive material	UN1818	Corrosive	173.244	173.247	1 quart	1 gallon	1	1	5
	Silicon chrome, exothermic. <i>See</i> Ferrochrome, exothermic										
+	Silicon tetrafluoride	Non- flammable gas	UN1859	Non- flammable gas	173.306	173.302	Forbidden	300 pounds	1	4	60
	Silver acetylide (dry)	Forbidden									
	Silver azide (dry)	Forbidden									
	Silver chlorite (dry)	Forbidden									
+	Silver cyanide	Poison B	UN1684	Poison	173.370	173.370	25 pounds	200 pounds	1,2	1,2	32
	Silver fulminate (dry)	Forbidden									
E	Silver nitrate (RQ-1/0.454)	Oxidizer	UN1493	Oxidizer	173.153	173.182	25 pounds	100 pounds	1,2	1,2	60
	Silver oxalate (dry)	Forbidden									
	Silver picrate (dry)	Forbidden									
	Sisal. <i>See</i> Fibers										
	Sludge acid. <i>See</i> Acid, sludge										
	Small arms ammunition	Class C explosive		None	173.101		50 pounds	150 pounds	1,3	1,3	
	Small arms ammunition, irritat- ing (tear gas) cartridge	Class C explosive		Irritant	None	173.101	Forbidden	150 pounds	1,3	1,3	
	Small arms primer	Class C explosive		None	None	173.107	50 pounds	150 pounds	1,3	1,3	
	Smoke candle	Class C explosive		Explosive C	None	173.108	50 pounds	200 pounds	1,3	1,3	
	Smoke generator. <i>See</i> Chemical ammunition, nonexplosive (containing a Poison A, Poison B or irritating material, as appropriate)										
	Smoke grenade	Class C explosive		Explosive C	None	173.108	50 pounds	150 pounds	1,3	1,3	
	Smokeless powder for cannon or small arms. <i>See</i> Propellant explosive, Class A or B, as appropriate										
	Smokeless powder for small arms (100 pounds or less)	Flammable solid	NA1325	Flammable solid	173.88	173.197a	Forbidden	Forbidden	1,3	1,3	125
	Smoke pot	Class C explosive		Explosive C	None	173.108	50 pounds	200 pounds	1,3	1,3	
	Smoke projectile with bursting charge. <i>See</i> Explosive projectile										
	Smoke projectile with expelling charge but without bursting charge. <i>See</i> Fireworks, special										
	Smoke signal	Class C explosive		Explosive C	None	173.108	50 pounds	200 pounds	1,3	1,3	
	Soda amatol. <i>See</i> High explosive										

ILLINOIS HAZARDOUS MATERIALS TRANSPORTATION REGULATIONS

§172.101 HAZARDOUS MATERIALS TABLE

(1) +/ E/ A/ W/	(2) Hazardous materials descriptions and proper shipping names	(3) Hazard class	(3A) ID Number	(4) Label(s) required (if not excepted)	(5) Packaging		(6) Maximum net quantity in one package		(7) Water Shipments		
					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
	Soda lime, solid	Corrosive material	UN1907	Corrosive	173.244	173.245b	25 pounds	100 pounds	1,2	1,2	13
	Sodium acid sulfate, solid <i>or</i> solution. <i>See appropriate entry</i>										
A	Sodium aluminate, solid	ORM-B	UN2812	None	173.505	173.800	25 pounds	100 pounds			
	Sodium aluminate solution	Corrosive material	UN1819	Corrosive	173.244	173.249	1 quart	5 gallons	1,2	1,2	
	Sodium aluminum hydride	Flammable solid	UN2835	Flammable solid and Dangerous when wet	None	173.206	Forbidden	25 pounds	1,2	5	14
	Sodium amide	Flammable solid	UN1425	Flammable solid and Dangerous when wet	None	173.206	Forbidden	25 pounds	1,2	5	14
E	Sodium arsenate (RQ-1000/454)	Poison B	UN1685	Poison	173.364	173.365 173.368	50 pounds	200 pounds	1,2	1,2	
E	Sodium arsenite, liquid, (solution), (RQ-1000/454)	Poison B	UN1686	Poison	173.345	173.346	1 quart	55 gallons	1,2	1,2	
+	Sodium azide	Poison B	UN1687	Poison	173.364	173.375	50 pounds	100 pounds	1,2	1,2	126
E	Sodium bifluoride, solid (RQ-5000/2270)	Corrosive material	UN2439	Corrosive	173.244	173.245b	25 pounds	100 pounds	1,2	1,2	
E	Sodium bifluoride, solution (RQ-5000/2270)	Corrosive material	UN2439	Corrosive	173.244	173.245	1 quart	5 gallons	1,2	1,2	
	Sodium bisulfate, solid <i>or</i> solution. <i>See Sodium hydrogen sulfate, solid or solution</i>										
E	Sodium bisulfite, solid, <i>or</i> solution. <i>See Sodium hydrogen sulfite, solid or solution</i>										
	Sodium bromate	Oxidizer	UN1494	Oxidizer	173.153	173.154	25 pounds	100 pounds	1,2	1,2	31
	Sodium chlorate (soda chlorate)	Oxidizer	UN1495	Oxidizer	173.153	173.163	25 pounds	100 pounds	1,2	1,2	31
	Sodium chlorite	Oxidizer	UN1496	Oxidizer	None	173.160	Forbidden	100 pounds	1,2	1,2	31
	Sodium chlorite solution (not exceeding 42% sodium chlorite)	Corrosive material	UN1908	Corrosive	173.244	173.263	1 quart	4 gallons	1,2	1	7
E	Sodium chromate (RQ-1000/454)	ORM-E	NA9145	None	None	173.510	No limit	No limit	1,2	1,2	
E	Sodium cyanide, solid (RQ-10/4.54)	Poison B	UN1689	Poison	173.370	173.370	25 pounds	200 pounds	1,2	1,2	32
E	Sodium cyanide solution (RQ-10/4.54)	Poison B	UN1689	Poison	173.345	173.352	1 quart	55 gallons	1,2	1,2	32
	Sodium dichloroisocyanurate. <i>See Sodium dichloro-s-triazinetriene</i>										
	Sodium dichloro-s-triazinetriene (dry, containing more than 39% available chlorine)	Oxidizer	UN2465	Oxidizer	173.153	173.217	50 pounds	100 pounds	1,2	1,2	
EA	Sodium dichromate (RQ-1000/454)	ORM-A	NA1479	None	173.505	173.510	No limit	No limit	1,2	1,2	
E	Sodium dodecylbenzenesulfonate (RQ-1000/454)	ORM-E	NA9146	None	None	173.510	No limit	No limit	1,2	1,2	
EA	Sodium fluoride, solid (RQ-5000/2270)	ORM-B	UN1690	None	173.505	173.510	No limit	No limit	1,2	1,2	

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(1) +/ E/ A/ W/	(2) Hazardous materials descriptions and proper shipping names	(3) Hazard class	(3A) ID Number	(4) Label(s) required (if not excepted)	(5) Packaging		(6) Maximum net quantity in one package		(7) Water Shipments		
					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
E	Sodium fluoride solution (RQ-5000/2270)	Corrosive material	UN1690	Corrosive	173.244	173.245	1 quart	5 gallons	1, 2	1, 2	32
E	Sodium hydrate. <i>See</i> Sodium hydroxide										
	Sodium hydride	Flammable solid	UN1427	Flammable solid and Dangerous when wet	None	173.198	Forbidden	25 pounds	1, 2	5	14
A	Sodium hydrogen sulfate, solid	ORM-B	UN1821	None	173.505	173.800	25 pounds	100 pounds			
	Sodium hydrogen sulfate solution	Corrosive material	UN2837	Corrosive	173.244	173.245	1 quart	1 gallon	1, 2	1, 2	
EA	Sodium hydrogen sulfite, solid (RQ-5000/2270)	ORM-B	NA2693	None	173.505	173.800	25 pounds	100 pounds	1, 2	1, 2	
E	Sodium hydrogen sulfite, solution (RQ-5000/2270)	Corrosive material	NA2693	Corrosive	173.244	173.245	1 quart	5 gallons	1, 2	1, 2	
E	Sodium hydrosulfide, solid (<i>with less than 25% water of crystal- lization</i>) (RQ-5000/2270)	Flammable solid	UN2318	Flammable solid	173.153	173.154	25 pounds	100 pounds	1, 2	1, 2	
E	Sodium hydrosulfide, solid (<i>with not less than 25% water of crystallization</i>) (RQ-5000/2270)	Corrosive material	NA2923	Corrosive	173.244	173.245b	25 pounds	100 pounds	1, 2	1, 2	
E	Sodium hydrosulfide, solution (RQ-5000/2270)	Corrosive material	NA2922	Corrosive	173.244	173.245	1 quart	5 gallons	1, 2	1, 2	
	Sodium hydrosulfite (<i>sodium dithionite</i>)	Flammable solid	UN1384	Flammable solid	173.153	173.204	25 pounds	100 pounds	1, 2	1, 2	127
E	Sodium hydroxide, dry solid, flake, bead, or granular (RQ-1000/454)	Corrosive material	UN1823	Corrosive	173.244	173.245b	25 pounds	200 pounds	1, 2	1, 2	13
E	Sodium hydroxide, liquid or solution (RQ-1000/454)	Corrosive material	UN1824	Corrosive	173.244	173.249	1 quart	5 gallons	1, 2	1, 2	
E	Sodium hypochlorite. <i>See</i> Hypochlorite solution or Hypochlorite solution containing not more than 7% available chlorine										
A	Sodium metabisulfite	ORM-B	NA2693	None	173.505	173.510	No limit	No limit			
E	Sodium, metal or metallic (RQ-1000/454)	Flammable solid	UN1428	Flammable solid and Dangerous when wet	None	173.206	Forbidden	25 pounds	1, 2	5	14
E	Sodium, metal dispersion in organic solvent (RQ-1000/454)	Flammable solid	UN1429	Flammable solid and Dangerous when wet	None	173.230	Forbidden	10 pounds	1, 2	5	14
E	Sodium, metal liquid alloy (RQ-1000/454)	Flammable solid	NA1421	Flammable solid and Dangerous when wet	None	173.202	Forbidden	1 pound	1, 2	5	14
E	Sodium methylate, alcohol mixture (RQ-1000/454)	Combust- ible liquid	NA1289	None	173.118a	None	No limit	No limit	1, 2	1, 2	
E	Sodium methylate, alcohol mixture (RQ-1000/454)	Flammable liquid	NA1289	Flammable liquid	173.118	173.119	1 quart	10 gallons	1, 2	1	
E	Sodium methylate, alcohol mixture (RQ-1000/454)	Corrosive material	NA1289	Corrosive	173.244	173.245	1 quart	1 quart	1, 2	1, 2	
E	Sodium methylate, dry (RQ-1000/454)	Flammable solid	UN1431	Flammable solid	173.153	173.154	25 pounds	100 pounds	1, 2	1	14

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(1) +/ E/ A/ W/	(2) Hazardous materials descriptions and proper shipping names	(3) Hazard class	(3A) ID Number	(4) Label(s) required (if not excepted)	(5) Packaging		(6) Maximum net quantity in one package		(7) Water Shipments		
					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
	Sodium monoxide, solid	Corrosive material	UN1825	Corrosive	173.244	173.245b	25 pounds	100 pounds	1,2	1,2	13
	Sodium nitrate	Oxidizer	UN1498	Oxidizer	173.153	173.182	25 pounds	100 pounds	1,2	1,2	
	<i>Sodium nitrate bags. See Bags, sodium nitrate, empty and unwashed</i>										
E	Sodium nitrite (RQ-100/45.4)	Oxidizer	UN1500	Oxidizer	173.153	173.234	25 pounds	100 pounds	1,2	1,2	129
E	Sodium nitrite mixed (fused) with potassium nitrate (RQ-100/45.4)	Oxidizer	UN1487	Oxidizer	173.153	173.183	25 pounds	100 pounds	1,2	1,2	128
E	Sodium nitrite mixture (sodium nitrate, sodium nitrite, and potassium nitrate) (RQ-100/45.4)	Oxidizer	NA1487	Oxidizer	173.153	173.234	25 pounds	100 pounds	1,2	1,2	128
A	Sodium pentachlorophenate	ORM-A	UN2567	None	173.505	173.510	No limit	No limit			
	Sodium perchlorate	Oxidizer	UN1502	Oxidizer	173.153	173.154	25 pounds	100 pounds	1,3	1,3	21
	Sodium permanganate	Oxidizer	UN1503	Oxidizer	173.153	173.154	25 pounds	100 pounds	1,2	1,2	33
	Sodium peroxide	Oxidizer	UN1504	Oxidizer	None	173.187	Forbidden	100 pounds	1,2	1	130
	Sodium phenolate, solid	Corrosive material	UN2497	Corrosive	173.244	173.245b	25 pounds	100 pounds	1,2	1,2	
E	Sodium phosphate, dibasic (RQ-5000/2270)	ORM-E	NA9147	None	None	173.510	No limit	No limit	1,2	1,2	
E	Sodium phosphate, tribasic (RQ-5000/2270)	ORM-E	NA9148	None	None	173.510	No limit	No limit	1,2	1,2	
	Sodium phosphide	Flammable solid	UN1432	Flammable solid and Dangerous when wet	None	173.154	Forbidden	25 pounds	1	5	
	Sodium picramate, wet (with at least 20% water)	Flammable solid	UN1349	Flammable solid	None	173.205	Forbidden	25 pounds	1,2	5	131
	<i>Sodium pieryl peroxide</i>	Forbidden									
E	Sodium potassium alloy (liquid) (RQ-1000/454)	Flammable solid	UN1422	Flammable solid and Dangerous when wet	None	173.206	Forbidden	1 pound	1,2	5	132
E	Sodium potassium alloy (solid) (RQ-1000/454)	Flammable solid	UN1422	Flammable solid and Dangerous when wet	None	173.206	Forbidden	25 pounds	1,2	5	132
E	Sodium selenite (RQ-1000/454)	Poison B	UN2630	Poison	173.364	173.365	50 pounds	200 pounds	1,2	1,2	
	Sodium sulfide, anhydrous	Flammable solid	UN1385	Flammable solid	173.153	173.207	25 pounds	300 pounds	1,2	1,2	133
	<i>Sodium tetranitride</i>	Forbidden									
	Solvent, n.o.s.	Combustible liquid	NA1993	None	173.118a	None	No limit	No limit	1,2	1,2	
	Solvent, n.o.s.	Flammable liquid	NA1993	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	<i>Sparklers. See Fireworks, common</i>										

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(1) +/ E/ A/ W/	(2) Hazardous materials descriptions and proper shipping names	(3) Hazard class	(3A) ID Number	(4) Label(s) required (if not excepted)	(5) Packaging		(6) Maximum net quantity in one package		(7) Water Shipments		
					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
	<i>Spent iron mass. See</i> Iron mass, spent										
	<i>Spent iron sponge. See</i> Iron sponge, spent										
	<i>Spent mixed acid. See</i> Nitrating acid, spent										
	<i>Spent sulfuric acid. See</i> Sulfuric acid, spent										
	Spirits of nitroglycerin, (1 to 10%)	Flammable liquid	NA1204	Flammable liquid	None	173.133	Forbidden	6 quarts	1,2	5	125
	Spirits of nitroglycerin, not exceeding 1% nitroglycerin by weight	Flammable liquid	NA1204	Flammable liquid	173.118	173.133	1 quart	6 quarts	1,2	1	
E	Spirits of salt. <i>See</i> Hydrochloric acid										
	<i>Sporting powder. See</i> Black powder <i>or</i> Propellant explosive, solid										
	<i>Spray starting fluid. See</i> Engine starting fluid										
	<i>Spreader, cartridge. See</i> Fireworks, special										
	<i>Squib, electric <i>or</i> safety. See</i> Electric squib <i>or</i> Safety squib										
	Stain. <i>See</i> Paint, Enamel, Lacquer, Stain, Shellac, Varnish; etc.										
	Stannic phosphide	Flammable solid	UN1433	Flammable solid and Dangerous when wet	None	173.154	Forbidden	25 pounds	1	5	14
A	Stannous chloride, solid	ORM-B	NA1759	None	173.505	173.510	No limit	No limit			
	Starter cartridge	Class B explosive		Explosive B	None	173.92	Forbidden	200 pounds	1,3	5	
	Starter cartridge	Class C explosive		Explosive C	None	173.102	50 pounds	150 pounds	1,3	1,3	
	<i>Storage battery, wet. See</i> Battery, electric storage, wet										
	Straw. <i>See</i> Hay										
	Strontium arsenite, solid	Poison B	UN1691	Poison	173.364	173.365	50 pounds	200 pounds	1,2	1,2	
	Strontium chlorate	Oxidizer	UN1506	Oxidizer	173.153	173.163	25 pounds	100 pounds	1,2	1,2	146
	Strontium chlorate, wet	Oxidizer	UN1506	Oxidizer	173.153	173.163	25 pounds	200 pounds	1,2	1,2	146
E	Strontium chromate (RQ-1000/454)	ORM-E	NA9149	None	None	173.510	No limit	No limit	1,2	1,2	
	Strontium nitrate	Oxidizer	UN1507	Oxidizer	173.153	173.182	25 pounds	100 pounds	1,2	1,2	
	Strontium peroxide	Oxidizer	UN1509	Oxidizer	173.153	173.154	25 pounds	100 pounds	1,2	1,2	13
	Strychnine salt, solid	Poison B	UN1692	Poison	173.364	173.365	50 pounds	200 pounds	1,2	1,2	
E	Strychnine, solid (RQ-10/4.54)	Poison B	UN1692	Poison	173.364	173.365	Forbidden	200 pounds	1,2	1,2	

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(1) +/E/ A/ W/	(2) Hazardous materials descriptions and proper shipping names	(3) Hazard class	(3A) ID Number	(4) Label(s) required (if not excepted)	(5) Packaging		(6) Maximum net quantity in one package		(7) Water Shipments		
					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
	<i>Styphnate of lead. See Initiating explosive</i>										
E	Styrene monomer inhibited (RQ-1000/454)	Flammable liquid	UN2055	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1,2	
	Substituted nitrophenol pesticide, liquid, n.o.s. (compounds and preparations),	Flammable liquid	UN2780	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
	Substituted nitrophenol pesticide, liquid, n.o.s. (compounds and preparations),	Poison B	UN2779	Poison	173.345	173.346	1 quart	55 gallons	1,2	1,2	
	Substituted nitrophenol pesticide, solid, n.o.s. (compounds and preparations),	Poison B	UN2779	Poison	173.364	173.365	50 pounds	200 pounds	1,2	1,2	
	Succinic acid peroxide	Organic peroxide	UN2135	Organic peroxide	173.153	173.157 173.158	Forbidden	25 pounds	1	1	
	Succinic acid peroxide, technically pure. See Succinic acid peroxide		UN2135								
	Sucrose octanitrate (dry)	Forbidden									
	Sulfur and chlorate, loose mixtures of	Forbidden									
	Sulfur chloride (di)	Corrosive material	UN1828	Corrosive	None	173.247	Forbidden	1 gallon	1	1	5
E	Sulfur chloride (mono) (RQ-1000/454)	Corrosive material	UN1828	Corrosive	None	173.247	Forbidden	1 gallon	1	1	5
	Sulfur dioxide	Non-flammable gas	UN1079	Non-flammable gas	173.306	173.304 173.314 173.315	Forbidden	300 pounds	1,2	4	44
	Sulfur flower. See Sulfur, solid										
	Sulfur hexafluoride	Non-flammable gas	UN1080	Non-flammable gas	173.306	173.304	150 pounds	300 pounds	1,2	1,2	
E	Sulfuric acid (For fuming sulfuric acid, see Oleum) (RQ-1000/454)	Corrosive material	UN1830	Corrosive	173.244	173.272	1 quart	1 gallon	1	1	135
E	Sulfuric acid, spent (RQ-1000/454)	Corrosive material	UN1832	Corrosive	None	173.248	Forbidden	1 quart	1	1	147
	Sulfuric anhydride. See Sulfur trioxide										
	Sulfurous acid	Corrosive material	UN1833	Corrosive	173.244	173.245	2 gallons	2 gallons	1,2	1	7
W	Sulfur, solid	ORM-C	UN1350	None	173.505	173.1080			1,2	1,2	134
	Sulfur trioxide	Corrosive material	UN1829	Corrosive	173.244	173.273	Forbidden	1 gallon	1,2	1,2	114
	Sulfuryl chloride	Corrosive material	UN1834	Corrosive	173.244	173.247	1 quart	1 quart	1	1	5
	Sulfuryl fluoride	Non-flammable gas	UN2191	Non-flammable gas	173.306	173.304 173.314	150 pounds	300 pounds	1,3	1	
	Sulphur. See Sulfur, solid										
	Supplementary charge (explosive)	Class A explosive		Explosive A	None	173.69	Forbidden	Forbidden	6	5	

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					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
EA	2,4,5-T. See 2,4,5,-Trichloro- phenoxyacetic acid.										
E	2,4,5-T amine, ester, or salt. See 2,4,5-Trichlorophenoxyacetic acid, amine, ester, or salt Tankage. See Garbage tankage										
	Tankage fertilizer	Flammable solid	NA1325	Flammable solid	None	173.209	Forbidden	Forbidden	1	5	123
	Tankage, rough ammoniate	Flammable solid	NA1325	Flammable solid	None	173.210	Forbidden	Forbidden	1	5	123
	Tank car, containing residual phosphorus and filled with water or inert gas. See 173.190										
	Tank car, empty (previously used for a hazardous material), See 173.29										
	Tank car, empty (previously used for a Poison A material), See 172.510 and 173.29										
	Tank portable, empty (previously used for a hazardous material). See 172.510, 172.514 and 173.29										
	Tank truck, empty. See 172.510, 172.514 and 173.29										
	Tar, liquid	Combustible liquid	UN1999	None	173.118a	None	No limit	No limit	1.2	1.2	
	Tar, liquid	Flammable liquid	UN1999	Flammable liquid	173.118	173.131	1 quart	10 gallons	1.2	1	
EA	TDE (1,1-dichloro-2,2-bis(p- chlorophenyl)ethane) (RQ-170.454)	ORM-A	NA2761	None	173.505	173.510	50 pounds	No limit	1.2	1.2	
	Tear gas ammunition. See Chem- ical ammunition, nonexplosive (containing an irritant material)										
	Tear gas candle	Irritating material	UN1700	Irritant	None	173.385	Forbidden	75 pounds	1	5	44
	Tear gas cartridge. See Small arms ammunition, irritating (tear gas) cartridge										
	Tear gas device	Irritating material	NA1693	Irritant	None	173.385	Forbidden	75 pounds	1	5	44
	Tear gas grenade. See Grenade, tear gas										
	Tertiary alcohol. See Alcohol, n.o.s.										
	Tetraazido benzene quinone	Forbidden									
AW	Tetrachloroethane	ORM-A	UN1702	None	173.505	173.620	1 quart	10 gallons	1.2	1.2	
A	Tetrachloroethylene or Perchloroethylene	ORM-A	UN1897	None	173.505	173.605	10 gallons	55 gallons			
	Tetraethylammonium perchlorate (imp)	Forbidden									
	Tetraethyl dithiopyrophosphate and compressed gas mixture	Poison A	UN1703	Poison gas	None	173.334	Forbidden	Forbidden	1	5	136

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	Tetraethyl dithiopyrophosphate, liquid	Poison B	UN1704	Poison	None	173.358	Forbidden	1 quart	1	5	
	Tetraethyl dithiopyrophosphate mixture, dry	Poison B	UN1704	Poison	None	173.377	Forbidden	200 pounds	1	5	
	Tetraethyl dithiopyrophosphate mixture, liquid	Poison B	UN1704	Poison	None	173.359	Forbidden	1 quart	1	5	
E	Tetraethyl lead, liquid (including flash point for export shipment by water) (RQ-100/45.4)	Poison B	NA1649	Poison	None	173.354	Forbidden	55 gallons	1	5	11
E	Tetraethyl pyrophosphate and compressed gas mixture (RQ-100/45.4)	Poison A	UN1705	Poison gas	None	173.334	Forbidden	Forbidden	1	5	136
E	Tetraethyl pyrophosphate, liquid (RQ-100/45.4)	Poison B	NA2783	Poison	None	173.358	Forbidden	1 quart	1,2	5	
E	Tetraethyl pyrophosphate mixture, dry (RQ-100/45.4)	Poison B	NA2783	Poison	None	173.377	Forbidden	200 pounds	1,2	5	
E	Tetraethyl pyrophosphate mixture, liquid (RQ-100/45.4)	Poison B	NA2783	Poison	None	173.359	Forbidden	1 quart	1,2	5	
+	Tetrafluoroethylene, inhibited	Flammable gas	UN1081	Flammable gas	173.306	173.304	Forbidden	300 pounds	1,2	1,2	44
	1,2,3,6-Tetrahydrobenzaldehyde	Corrosive material	UN2498	Corrosive	173.244	173.245	1 quart	10 gallons	1,2	1,2	
	Tetrahydrofuran	Flammable liquid	UN2056	Flammable liquid	None	173.119	Forbidden	10 gallons	1,3	5	
	Tetralin hydroperoxide, technically pure. See Organic peroxide, solid, n.o.s.		UN2136								
	Tetramethylammonium hydroxide, liquid	Corrosive material	UN1835	Corrosive	173.244	173.245	1 quart	10 gallons	1,2	1,2	
	1,1,3,3-Tetramethylbutyl hydroperoxide, technically pure. See Organic peroxide, liquid or solution, n.o.s.		UN2160								
	1,1,3,3-Tetramethylbutyl peroxy-2-ethylhexanoate, technically pure. See Organic peroxide, liquid or solution, n.o.s.		UN2161								
	Tetramethylene diperoxide dicarbamide	Forbidden									
A	Tetramethylmethylenediamine	ORM-A	NA9069	None	173.505	173.510	No limit	No limit			
	Tetranitro diglycerin	Forbidden									
	Tetranitromethane	Oxidizer	UN1510	Oxidizer	None	173.203	Forbidden	Forbidden	1	5	138
	2,3,4,6-Tetranitrophenol	Forbidden									
	2,3,4,6-Tetranitrophenyl methyl nitramine	Forbidden									
	2,3,4,6-Tetranitrophenyl-nitramine	Forbidden									
	Tetranitroresorcinol (dry)	Forbidden									
	2,3,5,6-Tetranitroso-1,4-dinitrobenzene	Forbidden									
	2,3,5,6-Tetranitroso nitrobenzene (dry)	Forbidden									
	Tetrazene (guanyl nitrosamino guanyltetrazene). See Initiating explosive										

ILLINOIS HAZARDOUS MATERIALS TRANSPORTATION REGULATIONS

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(1) +/ E/ A/ W/	(2) Hazardous materials descriptions and proper shipping names	(3) Hazard class	(3A) ID Number	(4) Label(s) required (if not excepted)	(5) Packaging		(6) Maximum net quantity in one package		(7) Water Shipments		
					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
	<i>Tetrazaine (dry)</i>	Forbidden									
	<i>Tetrazolyl azide (dry)</i>	Forbidden									
	<i>Tetryl. See High explosive</i>										
	Textile treating compound or mixture, liquid	Corrosive material	NA1760	Corrosive		173.249a	1 quart	10 gallons	1,2	1,2	
	Textile waste. <i>See Cotton waste</i>										
	Textile waste, wet	Flammable solid	UN1857	Flammable solid	None	173.211	Forbidden	Forbidden	1,2	1,2	29
	Thallium salt, solid, n.o.s.	Poison B	NA1707	Poison	173.364	173.365	50 pounds	200 pounds	1,2	1,2	
E	Thallium sulfate, solid (RQ-1000/454)	Poison B	NA1707	Poison	173.364	173.365	50 pounds	200 pounds	1,2	1,2	
	Thinner for rust preventive coating. <i>See Rust preventive coating</i>										
	Thinning compound, paint, varnish, lacquer, etc. <i>See Compound, lacquer, paint or varnish, removing, reducing or thinning, liquid</i>										
	Thiocarbonylchloride. <i>See Thiophosgene</i>										
	Thioglycolic acid	Corrosive material	UN1940	Corrosive	173.244	173.245	1 quart	1 gallon	1,2	1,2	7
	Thionyl chloride	Corrosive material	UN1836	Corrosive	None	173.247	Forbidden	1 gallon	1	1	5
+	Thiophosgene	Poison B	UN2474	Poison	None	173.356	Forbidden	1 gallon	1	5	4
	Thiophosphoryl chloride	Corrosive material	UN1837	Corrosive	None	173.271	Forbidden	1 quart	1	1	5
A	Thiram	ORM-A	NA2771	None	173.505	173.510	No limit	No limit			
	Thorium metal, pyrophoric	Radioactive material	NA9170	Radioactive and Flammable solid	173.226	173.226			1,2	1,2	
	Thorium nitrate	Radioactive material	NA9171	Radioactive and Oxidizer	173.392	173.393			1,2	1,2	139
	<i>Time fuze. See Fuze, time</i>										
	Tin chloride, fuming. <i>See Tin tetrachloride anhydrous</i>										
	Tinning flux. <i>See Zinc chloride solution</i>										
	Tin perchloride. <i>See Tin tetrachloride, anhydrous</i>										
	Tin tetrachloride, anhydrous	Corrosive material	UN1827	Corrosive	173.244	173.247	1 quart	1 quart	1	1	5
	Titanium metal powder, dry or wet with less than 3% water	Flammable solid	UN2546	Flammable solid	None	173.208	Forbidden	75 pounds	1,2	5	
	Titanium metal powder, wet with 20% or more water	Flammable solid	UN1352	Flammable solid	None	173.208	Forbidden	150 pounds	1,2	5	
E	Titanium sulfate solution containing not more than 45% sulfuric acid (RQ-1000/454)	Corrosive material	NA1760	Corrosive	173.244	173.297	1 quart	1 gallon	1	4	140

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(1) +/ E/ A/ W/	(2) Hazardous materials descriptions and proper shipping names	(3) Hazard class	(3A) ID Number	(4) Label(s) required (if not excepted)	(5) Packaging		(6) Maximum net quantity in one package		(7) Water Shipments		
					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
	Titanium tetrachloride	Corrosive material	UN1838	Corrosive	173.244	173.247	1 quart	10 gallons	1	1	5
E	Toluene (<i>toluol</i>) (RQ-1000/454)	Flammable liquid	UN1294	Flammable liquid	173.118	173.119	1 quart	10 gallons	1.2	1	
A	Toluenediamine	ORM-A	NA1709	None	173.505	173.510	No limit	No limit			
+	Toluene diisocyanate	Poison B	UN2078	Poison	173.345	173.346	Forbidden	55 gallons	1.3	1.3	4
	Toluene sulfonic acid, liquid	Corrosive material	UN2584	Corrosive	173.244	173.245	1 quart	10 gallons	1.2	1.2	
	<i>Torch. See Fireworks, common</i>										
	Torpedo, railway	Class B explosive		Explosive B	None	173.91	Forbidden	200 pounds	1.2	1.2	81
EA	Toxaphene (RQ-1/0.454)	ORM-A	NA2761	None	173.505	173.510	25 pounds	100 pounds	1.2	1.2	
	Toy caps	Class C explosive		Explosive C	None	173.100 173.109	50 pounds	150 pounds	1.3	1.3	
	Toy propellant device	Class C explosive		Explosive C	None	173.111	50 pounds	150 pounds	1.3	1.3	
	Toy smoke device	Class C explosive		Explosive C	None	173.111	50 pounds	150 pounds	1.3	1.3	
	<i>Toy torpedo. See Fireworks, special</i>										
E	2,4,5-TP. <i>See</i> 2,4,5-Trichloro- phenoxypropionic acid										
E	2,4,5-TP ester. <i>See</i> 2,4,5- Trichlorophenoxypropionic acid ester										
	Tracer	Class C explosive		Explosive C	None	173.105	50 pounds	150 pounds	1.3	1.3	
	Tracer fuze	Class C explosive		Explosive C	None	173.105	50 pounds	150 pounds	1.3	1.3	
	Tractor. <i>See</i> Motor vehicle										
	Trailer or truck body with re- frigeration or heating equip- ment. <i>See</i> Motor vehicle										
	Treated paper (<i>manufactured article properly dried to prevent spontaneous heating</i>). <i>See</i> Oiled material										
	Treated textile (<i>manufactured article properly dried to prevent spontaneous heating</i>). <i>See</i> Oiled material.										
	Triazine pesticide, liquid, n.o.s. (<i>compounds and prepara- tions</i>),	Flammable liquid	UN2764	Flammable liquid	173.118	173.119	1 quart	10 gallons	1.2	1	
	Triazine pesticide liquid, n.o.s. (<i>compounds and prepara- tions</i>), liquid	Poison B	UN2763	Poison	173.345	173.346	1 quart	55 gallons	1.2	1.2	
	Triazine pesticide, solid, n.o.s. (<i>compounds and prepara- tions</i>),	Poison B	UN2763	Poison	173.364	173.365	50 pounds	200 pounds	1.2	1.2	
	Tri-(<i>n</i> -nitroxyethyl) ammonium nitrate	Forbidden									
EA	Trichlorfon (RQ-1000/454)	ORM-A	NA2783	None	173.505	173.510	50 pounds	100 pounds	1.2	1.2	

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§172.101 HAZARDOUS MATERIALS TABLE

(1) +/ E/ A/ W/	(2) Hazardous materials descriptions and proper shipping names	(3) Hazard class	(3A) ID Number	(4) Label(s) required (if not excepted)	(5) Packaging		(6) Maximum net quantity in one package		(7) Water Shipments		
					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
	Trichloroacetic acid, solid	Corrosive material	UN1839	Corrosive	173.244	173.245b	25 pounds	100 pounds	1,2	1	
	Trichloroacetic acid solution	Corrosive material	UN2564	Corrosive	173.244	173.245	1 quart	1 quart	1,2	1,2	7
A	1,1,1-Trichloroethane	ORM-A	UN2831	None	173.505	173.605	10 gallons	55 gallons			
EA	Trichloroethylene (RQ-1000/454)	ORM-A	UN1710	None	173.505	173.605	10 gallons	55 gallons	1,2	1,2	
	Trichloromethyl perchlorate	Forbidden									
EA	Trichlorophenol (RQ-10/4.54)	ORM-A	NA2020	None	173.505	173.510	100 pounds	No limit	1,2	1,2	
EA	2,4,5-Trichlorophenoxyacetic acid (RQ-100/45.4)	ORM-A	NA2765	None	173.505	173.510	50 pounds	No limit	1,2	1,2	
E	2,4,5-Trichlorophenoxyacetic acid amine, ester, or salt (RQ-100/45.4)	ORM-E	NA2765	None	None	173.510	No limit	No limit	1,2	1,2	
EA	2,4,5-Trichlorophenoxypropionic acid (RQ-100/45.4)	ORM-A	NA2765	None	173.505	173.510	50 pounds	No limit	1,2	1,2	
E	2,4,5-Trichlorophenoxypropionic acid ester (RQ-100/45.4)	ORM-E	NA2765	None	None	173.510	No limit	No limit	1,2	1,2	
	Trichlorosilane	Flammable liquid	UN1295	Flammable liquid	None	173.136	Forbidden	10 gallons	1	5	14
	Trichloro-s-triazinetriene dry, containing over 39% available chlorine	Oxidizer	UN2468	Oxidizer	173.153	173.217	50 pounds	100 pounds	1,3	1,3	13
	(mono-(Trichloro)tetra-(mono-potassium dichloro)-penta-s-triazinetriene, dry (containing over 39% available chlorine)										
	Trick matches	Class C explosive		Explosive C	None	173.111	Forbidden	Forbidden	1,3	1,3	
	Trick noise maker, explosive	Class C explosive		Explosive C	None	173.111	50 pounds	150 pounds	1,3	1,3	
E	Triethanolamine dodcylbenzene-sulfonate (RQ-1000/454)	ORM-E	NA9151	None	None	173.510	No limit	No limit	1,2	1,2	
E	Triethylamine (RQ-5000/2270)	Flammable liquid	UN1296	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
+	Trifluorochloroethylene	Flammable gas	UN1082	Flammable gas	173.306	173.304 173.314	Forbidden	10 gallons	1,2	1	
	Triformoxime trinitrate	Forbidden									
	1,3,5-Trimethyl-2,4,6-trinitrobenzene	Forbidden									
	Trimethylacetyl chloride	Corrosive material	UN2438	Corrosive	173.244	173.247	1 quart	1 quart	1,2	1,2	
E	Trimethylamine, anhydrous (RQ-1000/454)	Flammable gas	UN1083	Flammable gas	173.306	173.304 173.314 173.315	Forbidden	300 pounds	1	4	
E	Trimethylamine, aqueous solution (RQ-1000/454)	Flammable liquid	UN1297	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	100
	Trimethylchlorosilane	Flammable liquid	UN1298	Flammable liquid	None	173.135	Forbidden	10 gallons	1,2	1	
	Trimethylene glycol dipe-chlorate	Forbidden									

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(1) +/ E/ A/ W/	(2) Hazardous materials descriptions and proper shipping names	(3) Hazard class	(3A) ID Number	(4) Label(s) required (if not excepted)	(5) Packaging		(6) Maximum net quantity in one package		(7) Water Shipments		
					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
	Trimethylol nitromethane trinitrate	Forbidden									
	2,4,6-Trinitro-1,3,5-triazido benzene (dry)	Forbidden									
	2,4,6-Trinitro-1,3-diazobenzene	Forbidden									
	Trinitroacetic acid	Forbidden									
	Trinitroacetonitrile	Forbidden									
	Trinitroamine cobalt	Forbidden									
	Trinitrobenzene, dry. See High explosive										
	Trinitrobenzene, wet containing at least 10% water	Flammable solid	UN1354	Flammable solid	173.212		1 pound	1 pound	1	4	23
	Trinitrobenzene, wet, containing at least 10% water, over 16 ounces in one outside packaging. See High explosive										
	Trinitrobenzoic acid, dry. See High explosive										
	Trinitrobenzoic acid, wet, containing at least 10% water	Flammable solid	UN1355	Flammable solid	173.192	173.193	1 pound	25 pounds	1	5	23
	Trinitrobenzoic acid, wet, containing at least 10% water, over 25 pounds in one outside packaging. See High explosives										
	Trinitroethanol	Forbidden									
	Trinitroethylnitrate	Forbidden									
	Trinitromethane	Forbidden									
	1,3,5-Trinitronaphthalene	Forbidden									
	2,4,6-Trinitrophenyl guanidine (dry)	Forbidden									
	2,4,6-Trinitrophenyl nitramine	Forbidden									
	2,4,6-Trinitrophenyl trimethylol methyl nitramine trinitrate (dry)	Forbidden									
	Trinitroresorcinol. See High explosive										
	2,4,6-Trinitroso-3-methyl nitraminoanisole	Forbidden									
	Trinitrotetramine cobalt nitrate	Forbidden									
	Trinitrotoluene, dry. See High explosive										
	Trinitrotoluene, wet containing at least 10% water	Flammable solid	UN1356	Flammable solid	173.212		1 pound	1 pound	1	4	23
	Trinitrotoluene, wet, containing at least 10% water, over 16 ounces in one outside packaging. See High explosive										
	Tris-(1-aziridinyl) phosphine oxide	Corrosive material	UN2501	Corrosive	173.244	173.299a	1 quart	1 gallon	1	1	5
	Tris, bis-bifluoroamino diethoxy propane (TVOPA)	Forbidden									

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(1) +/ E/ A/ W/	(2) Hazardous materials descriptions and proper shipping names	(3) Hazard class	(3A) ID Number	(4) Label(s) required (if not excepted)	(5) Packaging		(6) Maximum net quantity in one package		(7) Water Shipments		
					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
	Tungsten hexafluoride	Corrosive material	UN2196	Corrosive	None	173.284	Forbidden	110 pounds	1	5	91
	Turpentine	Combustible liquid	UN1299	None	173.118a	None	No limit	No limit	1,2	1,2	
	Turpentine	Flammable liquid	UN1299	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1,2	
	Turpentine substitute	Combustible liquid	UN1300	None	173.118a	None	No limit	No limit	1,2	1,2	
	Turpentine substitute	Flammable liquid	UN1300	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
W	Twisted jute packing (rope) (treated or untreated). See Oakum										
	Uranium hexafluoride, fissile (containing more than 0.7% U-235)	Radio-active material	NA9173	Radio-active and Corrosive	173.393	173.396			1,2	1,2	
	Uranium hexafluoride, low specific activity (containing 0.7% or less U-235)	Radio-active material	NA9174	Radio-active and Corrosive	173.392	173.393			1,2	1,2	
	Uranium metal, pyrophoric	Radio-active material	NA9175	Radio-active and Flammable solid	173.392	173.393 173.396			1,2	1,2	
E	Uranyl acetate (RQ-5000/2270)	Radio-active material	NA9180	Radio-active material	173.391	173.395			1,2	1,2	
E	Uranyl nitrate hexahydrate solution (RQ-5000/2270)	Radio-active material	NA9178	Radio-active and Corrosive	173.392	173.393 173.395 173.396			1,2	1,2	
E	Uranyl nitrate, solid (RQ-5000/2270)	Radio-active material	NA9177	Radio-active and Oxidizer	173.392	173.393 173.396			1,2	1,2	141
	Urea nitrate, dry. See High explosive										
	Urea nitrate, wet with 10% or more water	Flammable solid	UN1357	Flammable solid	173.192	173.193	1 pound	25 pounds	1,2	1,2	
	Urea nitrate, wet with 10% or more water, over 25 pounds in one outside packaging. See High explosive										
	Urea peroxide	Organic peroxide	NA1511	Organic peroxide	173.153	173.227	2 pounds	25 pounds	1	4	140
	Valeric acid	Corrosive material	NA1760	Corrosive	173.244	173.245	1 quart	10 gallons	1,2	1,2	
	Valeryl chloride	Corrosive material	UN2502	Corrosive	173.244	173.245	1 quart	1 gallon	1,2	1,2	
	Vanadium oxytrichloride	Corrosive material	UN2443	Corrosive	173.244	173.247a	Forbidden	1 quart	1	4	4
	Vanadium oxytrichloride and titanium tetrachloride mixture	Corrosive material	NA2443	Corrosive	None	173.245 173.245a	Forbidden	1 quart	1	4	4
E	Vanadium pentoxide (RQ-1000/454)	ORM-E	UN2862	None	None	173.510	No limit	No limit	1,2	1,2	
	Vanadium tetrachloride	Corrosive material	UN2444	Corrosive	173.244	173.247a	Forbidden	1 quart	1	4	4

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					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
E	Vanadyl sulfate (RQ-1000/454) Varnish. See Paint, Enamel, Lacquer, Stain, Shellac, Varnish; etc. Varnish drier. See Paint drier, liquid Varnish remover or reducer. See Compound, lacquer, paint or varnish, removing, reducing or thinning liquid Varnish thinning compound. See Compound, lacquer, paint, or varnish, removing, reducing, or thinning, liquid Very signal cartridge	ORM-E Class C explosive	NA9152	None Explosive C	None	173.510	No limit	No limit	1.2	1.2	
E	Vinyl acetate (RQ-1000/454)	Flammable liquid	UN1301	Flammable liquid	173.118	173.119	1 quart	10 gallons	1.2	1	
+	Vinyl chloride	Flammable gas	UN1086	Flammable gas	173.306	173.304 173.314 173.315	Forbidden	300 pounds	1.2	4	44
	Vinyl ethyl ether, inhibited	Flammable liquid	UN1302	Flammable liquid	None	173.119	Forbidden	1 gallon	1.3	5	
	Vinyl fluoride, inhibited	Flammable gas	UN1860	Flammable gas	173.306	173.304 173.314 173.315	Forbidden	300 pounds	1	4	
E	Vinylidene chloride, inhibited (RQ-5000/2270)	Flammable liquid	UN1303	Flammable liquid	173.118	173.119	1 quart	10 gallons	1.3	4	
	Vinyl isobutyl ether	Flammable liquid	UN1304	Flammable liquid	173.118	173.119	1 quart	10 gallons	1.2	1	
+	Vinyl methyl ether	Flammable gas	UN1087	Flammable gas	173.306	173.304 173.314	Forbidden	20 pounds	1.2	1	44
	Vinyl nitrate polymer	Forbidden									
	Vinyl trichlorosilane	Flammable liquid	UN1305	Flammable liquid	None	173.135	Forbidden	10 gallons	1.2	1	
	Vitriol, oil of. See Sulfuric acid										
	War head. See Explosive projectile										
	Waste, hazardous. See Hazardous waste, liquid or solid, n.o.s.										
	Waste paper, wet	Flammable solid	NA1325	Flammable solid	None	173.186	Forbidden	Forbidden	1.2	1.2	29
	Waste textile, wet	Flammable solid	UN1857	Flammable solid	None	173.211	Forbidden	Forbidden	1.2	1.2	29
	Waste wool, wet	Flammable solid	UN1387	Flammable solid	None	173.213	Forbidden	Forbidden	1.2	1.2	29
	Water pump system tank charged with compressed air or nitrogen	Non-flammable gas	NA1956	None	173.306		Forbidden	Forbidden	1.2	1.2	
	Water reactive solid, n.o.s.	Flammable solid	UN2813	Flammable solid and Dangerous when wet	173.153	173.154	Forbidden	25 pounds	1.2	4	14

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					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
	Water treatment compounds, liquid	Corrosive material	NA1760	Corrosive	173.244	173.249	1 quart	10 gallons	1	1	
	Wax, liquid	Combustible liquid	NA1993	None	173.118a	None	No limit	No limit	1,2	1,2	
	<i>Wet hair. See Hair, wet</i>										
	<i>Wet textile waste. See Waste textile, wet</i>										
E	White acid (ammonium bifluoride and hydrofluoric acid mixture) (RQ-5000/2270)	Corrosive material	NA1760	Corrosive	173.244	173.264	1 quart	1 gallon	1	1	
	Wood filler, liquid. <i>See</i> Paint, Enamel, Lacquer, Stain, Shellac, Varnish; etc.										
	Wood shavings (when dry, clean and free from oil). <i>See</i> Sawdust										
	Wool waste. <i>See</i> Cotton waste										
	<i>Wool waste, wet. See Waste wool, wet</i>										
	Xenon	Non-flammable gas	UN2036	Non-flammable gas	173.306	173.302	150 pounds	300 pounds	1,2	1,2	
	X-ray film. <i>See</i> Film										
E	Xylene (Xylol) (RQ-1000/454)	Flammable liquid	UN1307	Flammable liquid	173.118	173.119	1 quart	10 gallons	1,2	1	
EA	Xylenol (RQ-1000/454)	ORM-A	UN2261	None	173.505	173.510	100 pounds	No limit	1,2	1,2	
	Xylyl bromide	Irritating material	UN1701	Irritant	None	173.382	Forbidden	75 pounds	1	5	44
	<i>p-Xylyl diazide</i>	Forbidden									
A	Yeast, active, in liquid or pressed form	ORM-C		None	None	173.1085	No limit	No limit			
E	Zinc acetate (RQ-1000/454)	ORM-E	NA9153	None	None	173.510	No limit	No limit	1,2	1,2	
E	Zinc ammonium chloride (RQ-5000/2270)	ORM-E	NA9154	None	None	173.510	No limit	No limit	1,2	1,2	
	Zinc ammonium nitrite	Oxidizer	UN1512	Oxidizer	None	173.228	25 pounds	100 pounds	1,3	5	142
	Zinc arsenate	Poison B	UN1712	Poison	173.364	173.365	50 pounds	200 pounds	1,2	1,2	
	Zinc arsenite, solid	Poison B	UN1712	Poison	173.364	173.365	50 pounds	200 pounds	1,2	1,2	
E	Zinc borate (RQ-1000/454)	ORM-E	NA9155	None	None	173.510	No limit	No limit	1,2	1,2	
E	Zinc bromide (RQ-5000/2270)	ORM-E	NA9156	None	None	173.510	No limit	No limit	1,2	1,2	
E	Zinc carbonate (RQ-1000/454)	ORM-E	NA9157	None	None	173.510	No limit	No limit	1,2	1,2	
	Zinc chlorate	Oxidizer	UN1513	Oxidizer	173.153	173.163	25 pounds	100 pounds	1,2	1,2	31
E	Zinc chloride, solid (RQ-5000/2270)	ORM-E	UN2331	None	None	173.510	No limit	No limit	1,2	1,2	
E	Zinc chloride solution (RQ-5000/2270)	Corrosive material	UN1840	Corrosive	173.244	173.245	1 quart	1 quart	1,2	1,2	
E	Zinc cyanide (RQ-12/4.54)	Poison B	UN1713	Poison	173.370	173.370	25 pounds	200 pounds	1,2	1,2	32

ILLINOIS HAZARDOUS MATERIALS TRANSPORTATION REGULATIONS

§172.101 HAZARDOUS MATERIALS TABLE

(1) +/E/ A/ W/	(2) Hazardous materials descriptions and proper shipping names	(3) Hazard class	(3A) ID Number	(4) Label(s) required (if not excepted)	(5) Packaging		(6) Maximum net quantity in one package		(7) Water Shipments		
					(a) Excep- tions	(b) Specific require- ments	(a) Passenger carrying aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other require- ments See Sec. 172.101(i)
	<i>Zinc ethyl. See Pyrophoric liquid, n.o.s.</i>										
E	Zinc fluoride (RQ-1000/454)	ORM-E	NA9158	None	None	173.510	No limit	No limit	1,2	1,2	
E	Zinc formate (RQ-1000/454)	ORM-E	NA9159	None	None	173.510	No limit	No limit	1,2	1,2	
EA	Zinc hydrosulfite (RQ-1000/454)	ORM-A	UN1931	None	173.505	173.510	50 pounds	100 pounds	1,2	1,2	13,152
E	Zinc muriate solution. <i>See</i> Zinc chloride solution										
E	Zinc nitrate (RQ-5000/2270)	Oxidizer	UN1514	Oxidizer	173.153	173.182	25 pounds	100 pounds	1,2	1,2	
	Zinc permanganate	Oxidizer	UN1515	Oxidizer	173.153	173.154	25 pounds	100 pounds	1,2	1,2	33
	Zinc peroxide	Oxidizer	UN1516	Oxidizer	173.153	173.154	25 pounds	100 pounds	1,2	1,2	13
E	Zinc phenolsulfonate (RQ-5000/2270)	ORM-E	NA9160	None	None	173.510	No limit	No limit	1,2	1,2	
E	Zinc phosphide (RQ-1000/454)	Poison B	UN1714	Poison	173.364	173.365	25 pounds	100 pounds	1,2	1,2	152
E	Zinc silicofluoride (RQ-5000/2270)	ORM-E	UN2855	None	None	173.510	No limit	No limit	1,2	1,2	
E	Zinc sulfate (RQ-1000/454)	ORM-E	NA9161	None	None	173.510	No limit	No limit	1,2	1,2	
	Zirconium hydride	Flammable solid	UN1437	Flammable solid and Dangerous when wet	None	173.206	Forbidden	150 pounds	1,2	5	14
	Zirconium metal, dry, chemically produced, finer than 20 mesh particle size	Flammable solid	UN2008	Flammable solid	None	173.214	Forbidden	75 pounds	1	5	29
	Zirconium metal, dry, mechanically produced, finer than 270 mesh particle size	Flammable solid	UN2008	Flammable solid	None	173.214	Forbidden	75 pounds	1	5	29
	Zirconium, metal, liquid, suspensions	Flammable liquid	UN1308	Flammable liquid	None	173.140	Forbidden	5 gallons	1	5	
	Zirconium metal, wet, chemically produced, finer than 20 mesh particle size	Flammable solid	UN1358	Flammable solid	None	173.214	Forbidden	150 pounds	1,2	5	
	Zirconium metal, wet, mechanically produced, finer than 270 mesh particle size	Flammable solid	UN1358	Flammable solid	None	173.214	Forbidden	150 pounds	1,2	5	
E	Zirconium nitrate (RQ-5000/2270)	Oxidizer	UN2728	Oxidizer	173.153	173.182	25 pounds	100 pounds	1,2	1,2	
	Zirconium picramate, wet with at least 20% of water	Flammable solid	UN1517	Flammable solid	None	173.216	Forbidden	25 pounds	1	1	144
E	Zirconium potassium fluoride (RQ-5000/2270)	ORM-E	NA9162	None	None	173.510	No limit	No limit	1,2	1,2	
	Zirconium scrap (borings, clippings, shavings, sheets, or turnings)	Flammable solid	UN1932	Flammable solid	173.153	173.220	Forbidden	Forbidden	1	4	29
EA	Zirconium sulfate (RQ-5000/2270)	ORM-B	NA9163	None	None	173.510	100 pounds	No limit	1,2	1,2	
E	Zirconium tetrachloride, solid (RQ-5000/2270)	Corrosive material	UN2503	Corrosive	173.244	173.245b	25 pounds	100 pounds	1,2	1,2	

(Source: 7 Ill. Reg 3486, effective April 2, 1983)

ILLINOIS HAZARDOUS MATERIALS TRANSPORTATION REGULATIONS

172.102 OPTIONAL HAZARDOUS MATERIALS TABLE FOR INTERNATIONAL SHIPMENTS

(a) The Optional Hazardous Materials Table (Optional Table) set forth at 49 CFR § 172.102 is hereby incorporated into this subchapter by reference.

(b) The Optional Hazardous Materials Table (Optional Table) set forth at 49 CFR § 172.102 provides descriptions, classifications, labeling and vessel stowage requirements which may be used for international shipments when authorized by § 171.12 of this subchapter. The Optional Table provides alternatives to corresponding requirements in § 172.101 of this subchapter subject to certain conditions and limitations set forth in 49 CFR § 172.102.

(c) Any person who offers for transportation, accepts for transportation or transports, over highways in Illinois, international shipments of hazardous materials described, classified, and labeled in accord with the provisions of 49 CFR § 172.102 must comply completely with all conditions, limitations and requirements of 49 CFR § 172.102.

(Source: 7 Ill. Reg 3486, effective April 2, 1983)

NOTE REGARDING THE FOLLOWING APPENDIX

The Appendix shown on the following 23 pages, which Appendix is entitled, "A - Identification Number Cross Reference to Proper Shipping Names in § 172.101", is an aid for persons using the Section 172.101 Hazardous Materials Table.

The Appendix is for informational purposes only.

App. A

APPENDIX A—IDENTIFICATION NUMBER CROSS REFERENCE TO PROPER SHIPPING NAMES IN § 172.101 AND § 172.102

This listing is provided for information purposes only.

(1)— Identification Number	(2)— Source 172.***	(3)—Description
UN 0001.....	102	Alarm devices, explosive.
UN 0004.....	102	Ammonium picrate.
UN 0005.....	102	Cartridges for weapons.
UN 0006.....	102	Cartridges for weapons.
UN 0007.....	102	Cartridges for weapons.
UN 0009.....	102	Ammunition, incendiary.
UN 0010.....	102	Ammunition, incendiary.
UN 0012.....	102	Cartridges for weapons.
UN 0014.....	102	Cartridges for weapons, blank.
UN 0015.....	102	Ammunition, smoke.
UN 0016.....	102	Ammunition, smoke.
UN 0018.....	102	Ammunition, tear producing.
UN 0019.....	102	Ammunition, tear producing.
UN 0020.....	102	Ammunition, toxic.
UN 0021.....	102	Ammunition, toxic.
UN 0022.....	102	Amorces.
UN 0027.....	102	Black powder.
UN 0028.....	102	Black powder, compressed.
UN 0029.....	102	Blasting caps, non-electric.
UN 0030.....	102	Blasting caps, electric.
UN 0033.....	102	Bombs.
UN 0034.....	102	Bombs.
UN 0035.....	102	Bombs.
UN 0037.....	102	Bombs, photo-flash.
UN 0038.....	102	Bombs, photo-flash.
UN 0039.....	102	Bombs, photo-flash.
UN 0042.....	102	Boosters.
UN 0042.....	102	Gaines, without detonator.
UN 0043.....	102	Bursters.
UN 0044.....	102	Caps, percussion.
UN 0044.....	102	Primers, cap type.
UN 0048.....	102	Charges, demolition.
UN 0049.....	102	Cartridges, flash.
UN 0050.....	102	Cartridges, flash.
UN 0054.....	102	Cartridges, signal.
UN 0055.....	102	Cases, cartridges, empty, with primer.
UN 0056.....	102	Charges, depth.
UN 0059.....	102	Charges, shaped.
UN 0060.....	102	Charges, supplementary, explosive.
UN 0065.....	102	Cord, detonating.
UN 0066.....	102	Cord, igniter.
UN 0070.....	102	Cutters, cable, explosive.
UN 0072.....	102	Cyclotrimethylenetrinitramine.
UN 0073.....	102	Detonators for ammunition.
UN 0074.....	102	Diazodinitrophenol.
UN 0075.....	102	Diethyleneglycol dinitrate.
UN 0076.....	102	Dinitrophenol.
UN 0077.....	102	Dinitrophenates.
UN 0078.....	102	Dinitroresorcinol.
UN 0079.....	102	Hexanitrodiphenylamine.
UN 0081.....	102	Explosives, blasting, Type A.
UN 0082.....	102	Explosives, blasting, Type B.
UN 0083.....	102	Explosives, blasting, Type C.
UN 0084.....	102	Explosives, blasting, Type D.
UN 0092.....	102	Flares, surface.
UN 0093.....	102	Flares, aerial.
UN 0094.....	102	Photo-flash powder.
UN 0096.....	102	Photo-flash powder.
UN 0099.....	102	Fracturing devices, explosive.
UN 0101.....	102	Fuse, instantaneous, non-detonating.
UN 0102.....	102	Cord, detonating.
UN 0103.....	102	Fuse, igniter.
UN 0104.....	102	Cord, detonating, mild effect.
UN 0105.....	102	Fuse, safety.
UN 0106.....	102	Fuzes, detonating.
UN 0107.....	102	Fuzes, detonating.
UN 0110.....	102	Grenades, practice.
UN 0113.....	102	Guanyl nitrosamino guanylidene hydrazine.
UN 0114.....	102	Guanyl nitrosamino guanyl tetrazene.
UN 0118.....	102	Hexolite.
UN 0121.....	102	Igniters.
UN 0124.....	102	Jet perforating guns, charged.
UN 0129.....	102	Lead azide.
UN 0130.....	102	Lead styphnate.
UN 0131.....	102	Lighters, fuse.
UN 0132.....	102	Deflagrating metal salts of aromatic nitro-derivatives, n.o.s.
UN 0133.....	102	Mannitol hexanitrate.
UN 0135.....	102	Mercury fulminate.
UN 0136.....	102	Mines.
UN 0137.....	102	Mines.
UN 0138.....	102	Mines.
UN 0143.....	102	Nitroglycerine, desensitized.
UN 0144.....	102	Nitroglycerine, spirit of.
UN 0146.....	102	Nitrostarch.
UN 0147.....	102	Nitro urea.
UN 0150.....	102	Pentaerythrite tetranitrate.
UN 0151.....	102	Pentolite.
UN 0153.....	102	Trinitro-aniline.
UN 0154.....	102	Trinitrophenol.
UN 0155.....	102	Trinitrochlorobenzene.
UN 0158.....	102	Potassium salts of nitro-aromatic derivatives.
UN 0159.....	102	Powder paste.
UN 0160.....	102	Powder, smokeless.
UN 0161.....	102	Powder, smokeless.
UN 0167.....	102	Projectiles.
UN 0168.....	102	Projectiles.
UN 0169.....	102	Projectiles.
UN 0171.....	102	Ammunition, illuminating.
UN 0173.....	102	Release devices, explosive.
UN 0174.....	102	Rivets, explosive.
UN 0180.....	102	Rockets.
UN 0181.....	102	Rockets.
UN 0182.....	102	Rockets.
UN 0183.....	102	Rockets.
UN 0186.....	102	Rocket motors.
UN 0190.....	102	Samples, explosive substance.
UN 0191.....	102	Signal devices, hand.
UN 0192.....	102	Signals, railway track, explosive.
UN 0193.....	102	Signals, railway track, explosive.
UN 0194.....	102	Signals, distress.
UN 0195.....	102	Signals, distress.
UN 0196.....	102	Signals, smoke.
UN 0197.....	102	Signals, smoke.
UN 0203.....	102	Sodium salts of nitro-aromatic derivatives.
UN 0204.....	102	Sounding devices, explosive.
UN 0206.....	102	Squibs.
UN 0207.....	102	Tetranitro-aniline.
UN 0208.....	102	Trinitrophenylmethyltrinitramine.
UN 0209.....	102	Trinitrotoluene.
UN 0212.....	102	Tracers for ammunition.
UN 0213.....	102	Trinitroanisole.

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App. A

(1)— Identification Number	(2)— Source 172.**	(3)—Description	(1)— Identification Number	(2)— Source 172.**	(3)—Description
UN 0214.....	102	Trinitrobenzene.	UN 0296.....	102	Sounding devices, explosive.
UN 0215.....	102	Trinitrobenzoic acid.	UN 0297.....	102	Ammunition, illuminating.
UN 0216.....	102	Trinitrometacresol.	UN 0299.....	102	Bombs, photo-flash.
UN 0217.....	102	Trinitronaphthalene.	UN 0300.....	102	Ammunition, incendiary.
UN 0218.....	102	Trinitrophenetole.	UN 0301.....	102	Ammunition, tear-producing.
UN 0219.....	102	Trinitroresorcinol.	UN 0303.....	102	Ammunition, smoke.
UN 0220.....	102	Urea nitrate.	UN 0305.....	102	Photo-flash powder.
UN 0221.....	102	Warheads, torpedo.	UN 0306.....	102	Tracers for ammunition.
UN 0222.....	102	Ammonium nitrate.	UN 0312.....	102	Cartridges, signal.
UN 0223.....	102	Ammonium nitrate fertilizers.	UN 0313.....	102	Signals, smoke.
UN 0224.....	102	Barium azide.	UN 0314.....	102	Igniters.
UN 0225.....	102	Boosters, with detonator.	UN 0315.....	102	Igniters.
UN 0225.....	102	Gaines, with detonator.	UN 0316.....	102	Fuzes, igniting.
UN 0226.....	102	Cyclotetramethylenetetranitramine.	UN 0317.....	102	Fuzes, igniting.
UN 0234.....	102	Sodium dinitro-o-cresolate.	UN 0318.....	102	Grenades, practice.
UN 0235.....	102	Sodium picramate.	UN 0319.....	102	Primers, tubular.
UN 0236.....	102	Zirconium picramate.	UN 0320.....	102	Primers, tubular.
UN 0237.....	102	Charges, shaped, flexible, linear.	UN 0321.....	102	Cartridges for weapons.
UN 0238.....	102	Rockets, line throwing.	UN 0322.....	102	Rocket motors.
UN 0240.....	102	Rockets, line throwing.	UN 0323.....	102	Cartridges, power device.
UN 0241.....	102	Explosives, blasting, Type E.	UN 0324.....	102	Projectiles.
UN 0242.....	102	Charges, propelling, for cannon.	UN 0325.....	102	Igniters.
UN 0243.....	102	Ammunition, incendiary, white phosphorus.	UN 0326.....	102	Cartridges for weapons, blank.
UN 0244.....	102	Ammunition, incendiary, white phosphorus.	UN 0327.....	102	Cartridges for weapons, blank.
UN 0245.....	102	Ammunition, smoke, white phosphorus.	UN 0328.....	102	Cartridges for weapons, with inert projectile.
UN 0246.....	102	Ammunition, smoke, white phosphorus.	UN 0329.....	102	Torpedoes.
UN 0247.....	102	Ammunition, incendiary.	UN 0330.....	102	Torpedoes.
UN 0248.....	102	Contrivances, water-activated.	UN 0331.....	102	Explosives, blasting, Type B.
UN 0249.....	102	Contrivances, water-activated.	UN 0332.....	102	Explosives, blasting, Type E.
UN 0250.....	102	Rocket motors.	UN 0333.....	102	Fireworks, Type A.
UN 0254.....	102	Ammunition, illuminating.	UN 0334.....	102	Fireworks, Type B.
UN 0255.....	102	Blasting caps, electric.	UN 0335.....	102	Fireworks, Type C.
UN 0257.....	102	Fuzes, detonating.	UN 0336.....	102	Fireworks, Type D.
UN 0266.....	102	Octolite.	UN 0337.....	102	Fireworks, Type D.
UN 0267.....	102	Blasting caps, non-electric.	UN 0338.....	102	Cartridges for weapons, blank.
UN 0268.....	102	Boosters, with detonator.	UN 0339.....	102	Cartridges for weapons, with inert projectile.
UN 0268.....	102	Gaines, with detonator.	UN 0340.....	102	Nitrocellulose with.
UN 0271.....	102	Charges, propelling, for rocket motors.	UN 0341.....	102	Nitrocellulose with.
UN 0272.....	102	Charges, propelling, for rocket motors.	UN 0342.....	102	Nitrocellulose with.
UN 0273.....	102	Charges, propelling, for rocket motors.	UN 0343.....	102	Nitrocellulose with.
UN 0274.....	102	Charges, propelling, for rocket motors.	UN 0344.....	102	Projectiles.
UN 0275.....	102	Cartridges, power device.	UN 0345.....	102	Projectiles.
UN 0276.....	102	Cartridges, power device.	UN 0346.....	102	Projectiles.
UN 0277.....	102	Cartridges, oil well.	UN 0347.....	102	Projectiles.
UN 0278.....	102	Cartridges, oil well.	UN 0348.....	102	Cartridges for weapons.
UN 0279.....	102	Charges, propelling, for cannon.	UN 0349.....	102	Articles, explosive, n.o.s.
UN 0280.....	102	Rocket motors.	UN 0350.....	102	Articles, explosive, n.o.s.
UN 0281.....	102	Rocket motors.	UN 0351.....	102	Articles, explosive, n.o.s.
UN 0282.....	102	Nitroguanidine.	UN 0352.....	102	Articles, explosive, n.o.s.
UN 0283.....	102	Boosters.	UN 0353.....	102	Articles, explosive, n.o.s.
UN 0283.....	102	Gaines, without detonator.	UN 0354.....	102	Articles, explosive, n.o.s.
UN 0284.....	102	Grenades.	UN 0355.....	102	Articles, explosive, n.o.s.
UN 0285.....	102	Grenades.	UN 0356.....	102	Articles, explosive, n.o.s.
UN 0286.....	102	Warheads, rocket.	UN 0357.....	102	Substances, explosive, n.o.s.
UN 0287.....	102	Warheads, rocket.	UN 0358.....	102	Substances, explosive, n.o.s.
UN 0288.....	102	Charges, shaped, flexible, linear.	UN 0359.....	102	Substances, explosive, n.o.s.
UN 0289.....	102	Cord, detonating.	UN 0360.....	102	Blasting cap assemblies, non-electric.
UN 0290.....	102	Cord, detonating.	UN 0361.....	102	Blasting cap assemblies, non-electric.
UN 0291.....	102	Bombs.	UN 0362.....	102	Ammunition, practice.
UN 0292.....	102	Grenades.	UN 0363.....	102	Ammunition, proof.
UN 0293.....	102	Grenades.	UN 0364.....	102	Detonators for ammunition.
UN 0294.....	102	Mines.	UN 0365.....	102	Detonators for ammunition.
UN 0295.....	102	Rockets.	UN 0366.....	102	Detonators for ammunition.
			UN 0367.....	102	Fuzes, detonating.
			UN 0368.....	102	Fuzes, igniting.
			UN 0369.....	102	Warheads, rocket.
			UN 0370.....	102	Warheads, rocket.

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App. A

(1)— Identification Number	(2)— Source 172.***	(3)—Description	(1)— Identification Number	(2)— Source 172.***	(3)—Description
UN 0371.....	102	Warheads, rocket.	UN 1036.....	101	Monoethylamine.
UN 0372.....	102	Grenades, practice.	UN 1037.....	101	Ethyl chloride.
UN 0373.....	102	Signal devices, hand.	UN 1038.....	102	Ethylene.
UN 0374.....	102	Sounding devices, explosive.	UN 1039.....	101	Ethyl methyl ether.
UN 0375.....	102	Sounding devices, explosive.	UN 1040.....	101	Ethylene oxide.
UN 0376.....	102	Primers, tubular.	UN 1041.....	102	Ethylene oxide and carbon dioxide.
UN 0377.....	102	Primers, cap type.	NA 1043.....	101	Crude nitrogen fertilizer solution.
UN 0378.....	102	Primers, cap type.	UN 1043.....	101	Fertilizer ammoniating solution.
UN 0379.....	102	Cases, cartridge, empty, with primer.	NA 1043.....	101	Nitrogen fertilizer solution.
UN 0380.....	102	Articles, pyrophoric.	UN 1044.....	101	Fire extinguisher.
UN 0381.....	102	Cartridges, power device.	UN 1044.....	102	Fire extinguishers.
UN 0382.....	102	Components, explosive train, n.o.s.	UN 1045.....	101	Fluorine.
UN 0383.....	102	Components, explosive train, n.o.s.	UN 1046.....	101	Helium.
UN 0384.....	102	Components, explosive train, n.o.s.	UN 1048.....	101	Hydrogen bromide.
UN 0385.....	102	5-Nitrobenzotriazole.	UN 1049.....	101	Hydrogen.
UN 0386.....	102	Trinitrobenzenesulfonic acid.	UN 1050.....	101	Hydrogen chloride.
UN 0387.....	102	Trinitrofluorenone.	NA 1051.....	101	Hydrocyanic acid, liquefied.
UN 0388.....	102	Trinitrotoluene.	UN 1051.....	102	Hydrogen cyanide.
UN 0389.....	102	Trinitrotoluene.	UN 1052.....	101	Hydrogen fluoride.
UN 0390.....	102	Trinitrotoluene.	UN 1053.....	101	Hydrogen sulfide.
UN 0391.....	102	Cyclotrimethylenetrinitramine mixed with cyclotetramethylenetetranitramine.	UN 1053.....	102	Hydrogen sulphide.
UN 0392.....	102	Hexanitrostilbene.	UN 1055.....	102	Isobutylene.
UN 0393.....	102	Hexatolal, cast.	UN 1056.....	102	Krypton.
UN 0394.....	102	Trinitroresorcinol.	UN 1057.....	101	Cigarette lighter.
UN 1001.....	101	Acetylene.	UN 1057.....	102	Lighters.
UN 1002.....	102	Air.	NA 1058.....	101	Liquefied non-flammable gas.
UN 1002.....	101	Air, compressed.	UN 1058.....	102	Liquefied non-flammable gases charged with nitrogen, carbon dioxide or air.
UN 1003.....	102	Air.	UN 1060.....	102	Methyl acetylene.
UN 1005.....	102	Ammonia.	UN 1060.....	101	Methylacetylene-propadiene, stabilized.
UN 1005.....	101	Ammonia, anhydrous.	UN 1061.....	102	Methylamine.
UN 1006.....	101	Argon.	UN 1061.....	101	Methylamine, anhydrous.
UN 1008.....	101	Boron trifluoride.	UN 1062.....	102	Methyl bromide.
UN 1009.....	102	Bromotrifluoromethane.	UN 1062.....	101	Methyl bromide, liquid.
UN 1009.....	101	Monobromotrifluoromethane.	UN 1063.....	101	Methyl chloride.
UN 1010.....	102	Butadiene.	UN 1064.....	101	Methyl mercaptan.
UN 1010.....	101	Butadiene, inhibited.	UN 1064.....	102	Methylmercaptan.
UN 1011.....	102	Butane.	UN 1065.....	101	Neon.
UN 1012.....	102	Butylene.	UN 1066.....	101	Nitrogen.
UN 1013.....	102	Carbon dioxide.	UN 1067.....	102	Nitrogen dioxide.
UN 1014.....	102	Carbon dioxide and oxygen.	UN 1067.....	101	Nitrogen dioxide, liquid.
UN 1014.....	101	Carbon dioxide-oxygen mixture.	NA 1067.....	101	Nitrogen peroxide, liquid.
UN 1015.....	102	Carbon dioxide and nitrous oxide.	NA 1067.....	101	Nitrogen tetroxide, liquid.
UN 1015.....	101	Carbon dioxide-nitrous oxide mixture.	UN 1069.....	101	Nitrosyl chloride.
UN 1016.....	101	Carbon monoxide.	UN 1070.....	101	Nitrous oxide.
UN 1017.....	101	Chlorine.	UN 1071.....	102	Oil gas.
UN 1018.....	102	Chlorodifluoromethane.	UN 1072.....	101	Oxygen.
UN 1018.....	101	Monochlorodifluoromethane.	UN 1073.....	102	Oxygen.
UN 1020.....	102	Chloropentafluoroethane.	UN 1073.....	101	Oxygen, pressurized liquid.
UN 1020.....	101	Monochloropentafluoroethane.	UN 1075.....	101	Liquefied petroleum gas.
UN 1021.....	102	Chlorotetrafluoroethane.	UN 1075.....	102	Petroleum gases.
UN 1021.....	101	Monochlorotetrafluoroethane.	UN 1076.....	101	Phosgene.
UN 1022.....	102	Chlorotrifluoromethane.	UN 1077.....	102	Propylene.
UN 1022.....	101	Monochlorotrifluoromethane.	UN 1078.....	102	Refrigerant gases, n.o.s.
UN 1023.....	102	Coal gas.	UN 1079.....	101	Sulfur dioxide.
UN 1026.....	102	Cyanogen.	UN 1079.....	102	Sulphur dioxide.
UN 1026.....	101	Cyanogen gas.	UN 1080.....	101	Sulfur hexafluoride.
UN 1027.....	101	Cyclopropane.	UN 1080.....	102	Sulphur hexafluoride.
UN 1028.....	101	Dichlorodifluoromethane.	UN 1081.....	102	Tetrafluoroethylene.
UN 1029.....	102	Dichloromonofluoromethane.	UN 1081.....	101	Tetrafluoroethylene, inhibited.
UN 1030.....	102	1,1-Difluoroethane.	UN 1082.....	101	Trifluorochloroethylene.
UN 1030.....	101	Difluoroethane.	UN 1082.....	102	Trifluorochloroethylene.
UN 1031.....	102	Difluoromonochloroethane.	UN 1083.....	102	Trimethylamine.
UN 1032.....	102	Dimethylamine.	UN 1083.....	101	Trimethylamine, anhydrous.
UN 1032.....	101	Dimethylamine, anhydrous.	UN 1085.....	102	Vinyl bromide.
UN 1033.....	101	Dimethyl ether.	UN 1086.....	101	Vinyl chloride.
UN 1035.....	101	Ethane.	UN 1087.....	101	Vinyl methyl ether.
UN 1036.....	102	Ethylamine.	UN 1088.....	101	Acetal.
			UN 1089.....	101	Acetaldehyde.

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App. A

(1)— Identification Number	(2)— Source 172.***	(3)—Description	(1)— Identification Number	(2)— Source 172.***	(3)—Description
UN 1090.....	101	Acetone.	NA 1142.....	101	Antifreeze compound, liquid.
UN 1091.....	101	Acetone oil.	NA 1142.....	101	Antifreeze preparation, liquid.
UN 1091.....	102	Acetone oils.	NA 1142.....	101	Compound, lacquer, paint, or var- nish, removing, reducing, or thin- ning, liquid.
UN 1092.....	102	Acrolein.	NA 1142.....	101	Compound, polishing, liquid.
UN 1092.....	101	Acrolein, inhibited.	NA 1142.....	101	Compound, vulcanizing, liquid.
UN 1093.....	101	Acrylonitrile.	NA 1142.....	101	Dressing, leather.
UN 1095.....	102	Alcohol.	UN 1142.....	102	Flammable liquid preparation, n.o.s.
UN 1096.....	102	Alcohol.	NA 1142.....	101	Leather bleach or dressing.
UN 1098.....	101	Allyl alcohol.	NA 1142.....	101	Polish, metal, stove, furniture or wood, liquid.
UN 1099.....	101	Allyl bromide.	NA 1142.....	101	Rust preventive coating.
UN 1100.....	101	Allyl chloride.	UN 1143.....	101	Crotonaldehyde.
UN 1101.....	102	Diethylaluminum chloride.	UN 1144.....	101	Crotonylene.
UN 1102.....	102	Aluminum triethyl.	UN 1145.....	101	Cyclohexane.
UN 1103.....	102	Aluminum trimethyl.	UN 1146.....	101	Cyclopentane.
UN 1104.....	101	Amyl acetate.	UN 1147.....	101	Decahydronaphthalene.
UN 1104.....	102	Amyl acetates.	UN 1148.....	102	Diacetone alcohol.
UN 1105.....	102	Amyl alcohols.	UN 1148.....	101	Diacetone alcohol.
UN 1106.....	101	Amylamine.	UN 1149.....	101	Butyl ether.
UN 1107.....	101	Amyl chloride.	UN 1149.....	102	Dibutyl ethers.
UN 1108.....	101	Amylene.	UN 1150.....	101	Dichloroethylene.
UN 1108.....	102	n-Amylene.	UN 1152.....	101	Dichloropentane.
UN 1109.....	101	Amyl formate.	UN 1152.....	102	Dichloropentanes.
UN 1109.....	102	Amyl formates.	UN 1153.....	102	1,2-Diethoxyethane.
UN 1110.....	102	Amyl methyl ketone.	UN 1153.....	101	Ethylene glycol diethyl ether.
UN 1110.....	101	Methyl amyl ketone.	UN 1154.....	101	Diethylamine.
UN 1111.....	101	Amyl mercaptan.	UN 1155.....	102	Diethyl ether
UN 1112.....	102	Amyl nitrate.	UN 1155.....	101	Ethyl ether.
UN 1113.....	101	Amyl nitrite.	UN 1156.....	101	Diethyl ketone.
UN 1114.....	101	Benzene.	UN 1157.....	101	Diisobutyl ketone.
UN 1115.....	101	Benzene.	UN 1158.....	101	Diisopropylamine.
UN 1118.....	102	Brake fluid, hydraulic.	UN 1159.....	101	Diisopropyl ether.
UN 1120.....	102	Butanol.	UN 1160.....	102	Dimethylamine.
NA 1120.....	101	Butyl alcohol.	UN 1160.....	101	Dimethylamine, aqueous solution.
UN 1121.....	102	sec-Butanol.	UN 1161.....	101	Dimethyl carbonate.
UN 1122.....	102	tert-Butanol.	UN 1162.....	101	Dimethyldichlorosilane.
UN 1123.....	101	Butyl acetate.	UN 1163.....	102	Dimethylhydrazine.
UN 1123.....	102	n-Butyl acetate.	UN 1163.....	101	Dimethylhydrazine, unsymmetrical.
UN 1124.....	102	sec-Butyl acetate.	UN 1164.....	101	Dimethyl sulfide.
UN 1125.....	101	Butylamine.	UN 1164.....	102	Dimethyl sulphide.
UN 1125.....	102	n-Butylamine.	UN 1165.....	101	Dioxane.
UN 1126.....	101	Butyl bromide.	UN 1166.....	101	Dioxolane.
UN 1126.....	102	n-Butyl bromide.	UN 1167.....	101	Divinyl ether.
UN 1127.....	101	Butyl chloride.	UN 1168.....	102	Driers.
UN 1127.....	102	n-Butyl chloride.	UN 1168.....	101	Paint drier, liquid.
UN 1128.....	101	Butyl formate.	UN 1169.....	102	Extracts.
UN 1128.....	102	n-Butyl formate.	UN 1170.....	101	Alcoholic beverage.
UN 1129.....	101	Butyraldehyde.	NA 1170.....	101	Cologne spirits.
UN 1130.....	101	Camphor oil.	UN 1170.....	102	Ethanol.
UN 1131.....	101	Carbon bisulfide, or Carbon disul- fide.	UN 1171.....	101	Ethyl alcohol.
UN 1131.....	102	Carbon disulphide.	UN 1171.....	102	2-Ethoxyethanol.
UN 1132.....	102	Carbon remover.	UN 1171.....	101	Ethylene glycol monoethyl ether.
UN 1132.....	101	Carbon remover, liquid.	UN 1172.....	102	2-Ethoxyethyl acetate.
UN 1133.....	102	Cement, adhesive.	UN 1172.....	101	Ethylene glycol monoethyl ether acetate.
NA 1133.....	101	Cement, container, linoleum, tile, or wallboard, liquid.	UN 1173.....	101	Ethyl acetate.
NA 1133.....	101	Cement, leather.	UN 1175.....	101	Ethyl benzene.
NA 1133.....	101	Cement, liquid, n.o.s.	UN 1175.....	102	Ethylbenzene.
NA 1133.....	101	Cement, pyroxylin.	UN 1176.....	101	Ethyl borate.
NA 1133.....	101	Cement, roofing, liquid.	UN 1177.....	102	Ethylbutyl acetate.
NA 1133.....	101	Cement, rubber.	UN 1177.....	101	Ethyl butyl acetate.
UN 1134.....	101	Chlorobenzene.	UN 1178.....	102	2-Ethylbutyraldehyde.
UN 1135.....	102	2-Chloroethanol.	UN 1178.....	101	Ethyl butyraldehyde.
UN 1135.....	101	Ethylene chlorohydrin.	UN 1179.....	101	Ethyl butyl ether
UN 1136.....	101	Coal tar distillate	UN 1180.....	101	Ethyl butyrate.
NA 1136.....	101	Coal tar light oil.	UN 1181.....	101	Ethyl chloroacetate.
NA 1136.....	101	Coal tar oil.	UN 1182.....	101	Ethyl chloroformate.
UN 1137.....	101	Coal tar distillate.	UN 1183.....	101	Ethyl dichlorosilane.
NA 1137.....	101	Coal tar light oil.	UN 1183.....	102	Ethyl dichlorosilane.
NA 1137.....	101	Coal tar oil.			
UN 1139.....	101	Coating solution.			

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App. A

(1)— Identification Number	(2)— Source 172.***	(3)—Description	(1)— Identification Number	(2)— Source 172.***	(3)—Description
UN 1184.....	101	Ethylene dichloride.	UN 1242.....	102	Methyldichlorosilane.
UN 1185.....	102	Ethyleneimine.	UN 1243.....	101	Methyl formate.
UN 1185.....	101	Ethylene imine, inhibited.	UN 1244.....	101	Methylhydrazine.
UN 1188.....	101	Ethylene glycol monomethyl ether.	UN 1245.....	102	Methyl isobutyl ketone.
UN 1189.....	101	Ethylene glycol monomethyl ether acetate.	UN 1246.....	102	Methyl isopropenyl ketone.
UN 1190.....	101	Ethyl formate.	UN 1246.....	101	Methyl isopropenyl ketone, inhibited.
UN 1191.....	102	Ethyl hexaldehyde.	UN 1247.....	102	Methyl methacrylate.
UN 1191.....	101	Ethylhexaldehyde.	UN 1247.....	101	Methyl methacrylate monomer, inhibited.
UN 1192.....	101	Ethyl lactate.	NA 1247.....	101	Methyl methacrylate monomer, uninhibited.
UN 1193.....	101	Ethyl methyl ketone.	UN 1248.....	101	Methyl propionate.
UN 1193.....	101	Methyl ethyl ketone.	UN 1249.....	101	Methyl propyl ketone.
UN 1194.....	102	Ethyl nitrite.	UN 1250.....	101	Methyltrichlorosilane.
UN 1194.....	101	Ethyl nitrite (nitrous ether).	UN 1251.....	102	Methyl vinyl ketone.
UN 1195.....	101	Ethyl propionate.	UN 1251.....	101	Methyl vinyl ketone, inhibited.
UN 1196.....	101	Ethyl trichlorosilane.	UN 1255.....	102	Naphtha, petroleum.
UN 1196.....	102	Ethyltrichlorosilane.	UN 1255.....	101	Petroleum naphtha.
UN 1197.....	101	Extract, liquid, flavoring.	UN 1256.....	101	Naphtha, solvent.
UN 1197.....	102	Extracts.	UN 1257.....	102	Casinghead gasoline.
UN 1198.....	102	Formaldehyde.	UN 1259.....	101	Nickel carbonyl.
UN 1198.....	101	Formaldehyde solution.	UN 1261.....	101	Nitromethane.
UN 1199.....	101	Furfural.	UN 1262.....	101	Isooctane.
UN 1201.....	101	Fusel oil.	UN 1262.....	101	Octane.
UN 1202.....	102	Gas oil.	NA 1263.....	101	Compound, enamel.
UN 1203.....	101	Gasoline.	UN 1263.....	101	Lacquer base or Lacquer chips, plastic.
NA 1203.....	101	Motor fuel, n.o.s.	UN 1263.....	101	Mortar stain, liquid.
UN 1204.....	102	Glyceryl trinitrate.	UN 1263.....	101	Paint, Enamel, Lacquer, Stain, Shellac, or Varnish; Aluminum, Bronze, Gold, Wood filler, liquid or Lacquer base, liquid.
NA 1204.....	101	Spirits of nitroglycerin.	UN 1263.....	102	Paint, enamel, lacquer, stain, shellac, varnish, polish, filler (liquid), lacquer base or thinner.
NA 1204.....	101	Spirits of nitroglycerin, not exceeding 1% nitroglycerin by weight.	UN 1264.....	101	Paraldehyde.
UN 1205.....	102	Gutta percha.	UN 1265.....	101	Isopentane.
UN 1206.....	101	Heptane.	UN 1265.....	101	Pentane.
UN 1207.....	101	Hexaldehyde.	UN 1266.....	102	Perfumery products.
UN 1208.....	101	Hexane.	UN 1267.....	101	Crude oil, petroleum.
UN 1208.....	101	Neohexane.	UN 1267.....	102	Petroleum crude oil.
UN 1210.....	102	Ink.	NA 1268.....	101	Naphtha distillate.
UN 1210.....	101	Ink, printers.	UN 1268.....	101	Petroleum distillate.
UN 1212.....	102	Isobutanol.	UN 1268.....	102	Petroleum distillates, n.o.s.
UN 1213.....	101	Isobutyl acetate.	NA 1268.....	101	Road oil.
UN 1214.....	101	Isobutylamine.	NA 1270.....	101	Oil.
UN 1216.....	101	Isocetene.	UN 1270.....	102	Petroleum oil.
UN 1218.....	101	Isoprene.	UN 1271.....	101	Petroleum ether.
UN 1219.....	101	Isopropanol.	UN 1271.....	102	Petroleum spirit.
UN 1220.....	101	Isopropyl acetate.	UN 1272.....	101	Pine oil.
UN 1221.....	101	Isopropylamine.	UN 1274.....	102	Propanol.
UN 1222.....	101	Isopropyl nitrate.	UN 1274.....	101	Propyl alcohol.
UN 1223.....	101	Kerosene.	UN 1275.....	101	Propionaldehyde.
UN 1224.....	102	Ketones.	UN 1276.....	102	n-Propyl acetate.
UN 1226.....	101	Cigarette lighter.	UN 1276.....	101	Propyl acetate.
UN 1226.....	101	Lighter fluid.	UN 1277.....	102	Monopropylamine.
UN 1226.....	102	Lighter fuels.	UN 1277.....	101	Propylamine.
UN 1226.....	102	Lighters.	UN 1278.....	101	Propyl chloride.
NA 1228.....	101	Mercaptan mixture, aliphatic.	UN 1279.....	101	Propylene dichloride.
UN 1228.....	102	Mercaptans and mercaptan mixtures.	UN 1280.....	101	Propylene oxide.
UN 1229.....	101	Mesityl oxide.	UN 1281.....	101	Propyl formate.
NA 1230.....	101	Columbian spirits.	UN 1281.....	102	Propyl formates.
UN 1230.....	102	Methanol.	UN 1282.....	101	Pyridine.
UN 1230.....	101	Methyl alcohol.	UN 1286.....	102	Rosin oil.
UN 1231.....	101	Methyl acetate.	UN 1287.....	102	Rubber solution.
UN 1232.....	101	Methyl acetone.	UN 1288.....	102	Shale oil.
UN 1233.....	101	Methylamyl acetate.	UN 1289.....	102	Sodium methylate.
UN 1234.....	101	Methylal.	NA 1289.....	101	Sodium methylate, alcohol mixture.
UN 1235.....	102	Methylamine.	UN 1292.....	101	Ethyl silicate.
UN 1235.....	101	Methylamine, aqueous solution.	UN 1292.....	102	Tetraethyl silicate.
UN 1237.....	101	Methyl butyrate.			
UN 1238.....	101	Methyl chloroformate.			
UN 1239.....	102	Methylchloromethyl ether.			
UN 1239.....	101	Methylchloromethyl ether, anhydrous.			
UN 1242.....	101	Methyl dichlorosilane.			

ILLINOIS HAZARDOUS MATERIALS TRANSPORTATION REGULATIONS

App. A

(1)— Identification Number	(2)— Source 172.***	(3)—Description	(1)— Identification Number	(2)— Source 172.***	(3)—Description
UN 1293.....	102	Tinctures.	UN 1337.....	101	Nitrostarch, wet with not less than 20% water.
UN 1294.....	101	Toluene.	NA 1337.....	101	Nitrostarch, wet with not less than 30% alcohol or solvent.
UN 1295.....	101	Trichlorosilane.	UN 1338.....	102	Phosphorus.
UN 1296.....	101	Triethylamine.	UN 1338.....	101	Phosphorus, amorphous, red.
UN 1297.....	102	Trimethylamine.	UN 1339.....	101	Phosphorus heptasulfide.
UN 1297.....	101	Trimethylamine, aqueous solution.	UN 1339.....	102	Phosphorus heptasulphide.
UN 1298.....	101	Trimethylchlorosilane.	UN 1340.....	101	Phosphorus pentasulfide.
UN 1299.....	101	Turpentine.	UN 1340.....	102	Phosphorus pentasulphide.
UN 1300.....	101	Turpentine substitute.	UN 1341.....	101	Phosphorus sesquisulfide.
UN 1301.....	101	Vinyl acetate.	UN 1341.....	102	Phosphorus sesquisulphide.
UN 1302.....	102	Vinyl ethyl ether.	UN 1343.....	101	Phosphorus trisulfide.
UN 1302.....	101	Vinyl ethyl ether, inhibited.	UN 1343.....	102	Phosphorus trisulphide.
UN 1303.....	101	Vinylidene chloride, inhibited.	UN 1344.....	102	Picric acid.
UN 1304.....	101	Vinyl isobutyl ether.	NA 1344.....	101	Picric acid, wet, with not less than 10% water.
UN 1305.....	101	Vinyl trichlorosilane.	UN 1345.....	102	Rubber scrap.
UN 1307.....	101	Xylene.	UN 1345.....	101	Rubber scrap or Rubber buffings.
UN 1307.....	102	Xylenes.	UN 1345.....	101	Rubber shoddy or Rubber, regenerated or Rubber, reclaimed.
UN 1308.....	102	Zirconium.	UN 1346.....	102	Silicon powder.
UN 1308.....	101	Zirconium, metal, liquid, suspensions.	UN 1348.....	102	Sodium dinitro-o-cresolate.
UN 1309.....	102	Aluminium.	UN 1349.....	102	Sodium picramate.
UN 1310.....	102	Ammonium picrate.	UN 1349.....	101	Sodium picramate, wet.
UN 1310.....	101	Ammonium picrate, wet.	UN 1350.....	101	Sulfur, solid.
UN 1312.....	102	Borneol.	UN 1350.....	102	Sulphur.
UN 1313.....	101	Calcium resinate.	UN 1352.....	102	Titanium metal powder, wet.
UN 1314.....	102	Calcium resinate.	UN 1352.....	101	Titanium metal powder, wet with 20% or more water.
UN 1314.....	101	Calcium resinate, fused.	UN 1353.....	102	Toe puffs.
UN 1318.....	102	Cobalt resinate.	UN 1354.....	102	Trinitrobenzene.
UN 1318.....	101	Cobalt resinate, precipitated.	UN 1354.....	101	Trinitrobenzene, wet.
UN 1320.....	102	Dinitrophenol.	UN 1355.....	102	Trinitrobenzoic acid.
UN 1321.....	102	Dinitrophenolates.	UN 1355.....	101	Trinitrobenzoic acid, wet.
UN 1322.....	102	Dinitroresorcinols.	UN 1356.....	102	Trinitrotoluene.
UN 1323.....	102	Ferrocenium.	UN 1356.....	101	Trinitrotoluene, wet.
NA 1324.....	101	Film.	UN 1357.....	102	Urea nitrate.
UN 1324.....	102	Film, motion picture.	UN 1357.....	101	Urea nitrate, wet.
NA 1325.....	101	Antimony sulfide, solid.	UN 1358.....	102	Zirconium metal powder, wet.
NA 1325.....	101	Burnt cotton, not repicked.	UN 1358.....	101	Zirconium metal, wet.
NA 1325.....	101	Cosmetics, n.o.s.	UN 1359.....	102	Bags.
NA 1325.....	101	Drugs, n.o.s.	UN 1359.....	101	Bags, sodium nitrate, empty and unwashed.
UN 1325.....	101	Flammable solid, n.o.s.	UN 1360.....	101	Calcium phosphide.
UN 1325.....	102	Flammable solids, n.o.s.	UN 1361.....	102	Carbon, non-activated.
NA 1325.....	101	Fusee.	NA 1361.....	101	Charcoal briquettes or briquets.
NA 1325.....	101	Garbage tankage.	NA 1361.....	101	Charcoal screenings, made from 'pinon' wood.
NA 1325.....	101	N-Methyl-N'-nitro-N-nitrosoguanidine.	NA 1361.....	101	Charcoal, shell.
NA 1325.....	101	Paper stock, wet.	NA 1361.....	101	Charcoal, wood, ground, crushed, granulated, or pulverized.
NA 1325.....	101	Rags, wet.	NA 1361.....	101	Charcoal, wood, lump.
NA 1325.....	101	Rough ammoniate tankage.	UN 1362.....	102	Charcoal wood screenings, other than 'pinon' wood screenings.
NA 1325.....	101	Smokeless powder for small arms.	UN 1362.....	101	Coal, ground bituminous, sea coal, coal facings.
NA 1325.....	101	Tankage fertilizer.	UN 1363.....	101	Carbon, activated.
NA 1325.....	101	Tankage, rough ammoniate.	UN 1363.....	101	Charcoal, activated.
NA 1325.....	101	Waste paper, wet.	UN 1364.....	101	Copra.
(UN 1325).....	102	Zirconium.	UN 1364.....	102	Cotton waste.
UN 1326.....	102	Hafnium metal powder, wet.	UN 1364.....	101	Cotton waste, oily.
UN 1326.....	101	Hafnium metal, wet.	UN 1365.....	102	Cotton.
UN 1327.....	102	Bhusa.	UN 1366.....	102	Diethylzinc.
UN 1327.....	101	Hay.	UN 1367.....	102	Diethylmagnesium.
UN 1327.....	101	Hay or straw.	UN 1368.....	102	Dimethylmagnesium.
UN 1327.....	102	Straw.	UN 1369.....	102	Dimethyl-p-nitrosoaniline.
UN 1329.....	102	Hexamine.	UN 1369.....	102	p-Nitrosodimethylamine.
UN 1330.....	102	Manganese resinate.	UN 1370.....	102	Dimethylzinc.
UN 1331.....	102	Matches.	UN 1371.....	102	Driers.
UN 1331.....	101	Matches, strike anywhere.	NA 1372.....	101	Burnt fiber.
UN 1332.....	102	Metalddehyde.			
UN 1333.....	102	Miscnmetal.			
UN 1334.....	102	Naphthalene.			
UN 1334.....	101	Naphthalene or Naphthalin.			
UN 1336.....	102	Nitroguanidine.			
UN 1336.....	101	Nitroguanidine, wet with not less than 20% water.			
UN 1337.....	102	Nitrostarch.			

App. A

(1)— Identification Number	(2)— Source 172.***	(3)—Description	(1)— Identification Number	(2)— Source 172.***	(3)—Description
NA 1372.....	101	Fibers.	UN 1414.....	101	Lithium hydride.
NA 1372.....	101	Fibers, burnt.	UN 1415.....	102	Lithium.
UN 1372.....	102	Fibres.	UN 1415.....	101	Lithium metal.
NA 1372.....	101	Hair, wet.	UN 1415.....	101	Lithium metal, in cartridges.
UN 1373.....	102	Fabric.	UN 1417.....	101	Lithium silicon.
NA 1373.....	101	Fibers or fabric, containing not more than 5% animal or vegeta- ble oil.	UN 1418.....	102	Magnesium.
UN 1373.....	102	Fibres.	UN 1418.....	102	Magnesium alloys.
UN 1374.....	102	Fishmeal or fish scrap.	UN 1419.....	102	Magnesium aluminium phosphide.
NA 1374.....	101	Fish meal or fish scrap containing less than 6% or more than 12% water.	UN 1419.....	101	Magnesium aluminum phosphide.
UN 1375.....	102	Pyrophoric fuel, n.o.s.	UN 1420.....	102	Potassium, metal alloys.
UN 1376.....	101	Iron mass or sponge, spent.	UN 1420.....	101	Potassium, metal liquid alloy.
UN 1376.....	102	Iron oxide.	UN 1421.....	102	Alkali metals.
UN 1378.....	102	Nickel catalyst.	NA 1421.....	101	Sodium, metal liquid alloy.
UN 1378.....	101	Nickel catalyst, wet.	UN 1422.....	102	Potassium-sodium.
UN 1379.....	102	Paper.	UN 1422.....	101	Sodium potassium alloy, liquid.
UN 1380.....	101	Pentaborane.	UN 1422.....	101	Sodium potassium alloy, solid.
UN 1381.....	102	Phosphorus.	UN 1423.....	102	Rubidium.
UN 1381.....	101	Phosphorus, white or yellow, dry.	UN 1423.....	101	Rubidium metal.
UN 1381.....	101	Phosphorus, white or yellow, in water.	UN 1423.....	101	Rubidium metal, in cartndges.
UN 1382.....	102	Alkaline earth metal amalgams, n.o.s.	UN 1424.....	102	Sodium amalgam.
UN 1382.....	101	Potassium sulfide.	UN 1425.....	101	Sodium amide.
UN 1382.....	102	Potassium sulphide.	UN 1426.....	102	Sodium borohydride.
NA 1383.....	101	Iron mass or sponge.	UN 1427.....	101	Sodium hydride.
UN 1383.....	102	Pyrophoric alloys.	UN 1428.....	102	Sodium.
UN 1383.....	102	Pyrophoric metals.	UN 1428.....	101	Sodium, metal or metallic.
UN 1384.....	102	Sodium dithionite.	UN 1429.....	102	Sodium.
UN 1384.....	101	Sodium hydrosulfite.	UN 1429.....	101	Sodium, metal dispersion in organic solvent.
UN 1385.....	101	Sodium sulfide, anhydrous.	UN 1431.....	102	Sodium methylate.
UN 1385.....	102	Sodium sulphide.	UN 1431.....	101	Sodium methylate, dry.
UN 1386.....	102	Seed cake.	UN 1432.....	101	Sodium phosphide.
UN 1387.....	101	Waste wool, wet.	UN 1433.....	101	Stannic phosphide.
UN 1387.....	102	Wool waste.	UN 1433.....	102	Stannic phosphides.
UN 1389.....	102	Alkali metal amalgams, n.o.s.	UN 1434.....	102	Strontium.
UN 1390.....	102	Alkali metal amides, n.o.s.	UN 1435.....	102	Zinc ashes.
UN 1391.....	102	Alkali metal dispersions, n.o.s.	UN 1436.....	102	Zinc.
UN 1393.....	102	Alloys of alkaline earth metals.	UN 1437.....	101	Zirconium hydride.
UN 1394.....	102	Aluminium carbide.	UN 1438.....	102	Aluminium nitrate.
UN 1395.....	102	Aluminium ferrosilicon.	UN 1438.....	101	Aluminium nitrate.
UN 1396.....	102	Aluminium.	UN 1439.....	101	Ammonium dichromate.
UN 1396.....	101	Aluminium, metallic, powder.	UN 1442.....	101	Ammonium perchlorate.
UN 1397.....	102	Aluminium phosphide.	UN 1444.....	102	Ammonium persulphate.
UN 1397.....	101	Aluminium phosphide.	UN 1445.....	101	Banum chlorate.
UN 1398.....	102	Aluminium silicon.	NA 1445.....	101	Banum chlorate, wet.
UN 1399.....	102	Barium.	UN 1446.....	101	Banum nitrate.
UN 1400.....	102	Banum.	UN 1447.....	101	Banum perchlorate.
UN 1401.....	102	Calcium.	UN 1448.....	101	Barium permanganate.
UN 1401.....	101	Calcium, metal.	UN 1449.....	102	Banum peroxide.
NA 1401.....	101	Calcium, metal, crystalline.	UN 1449.....	101	Banum peroxide .
UN 1402.....	101	Calcium carbide.	UN 1450.....	102	Bromates.
UN 1403.....	102	Calcium cyanamide.	UN 1451.....	102	Caesium nitrate.
UN 1403.....	101	Calcium cyanamide, not hydrated.	UN 1452.....	101	Calcium chlorate.
UN 1404.....	102	Calcium hydride.	UN 1453.....	101	Calcium chlonte.
UN 1405.....	102	Calcium silicide.	UN 1454.....	101	Calcium nitrate.
UN 1406.....	102	Calcium silicon.	UN 1455.....	102	Calcium perchlorate.
UN 1407.....	102	Caesium.	UN 1456.....	101	Calcium permanganate.
UN 1407.....	101	Cesium metal.	UN 1457.....	101	Calcium peroxide.
UN 1408.....	101	Ferrosilicon.	UN 1458.....	102	Borate and chlorate.
UN 1409.....	102	Hydrides.	UN 1458.....	101	Chlorate and borate mixture.
UN 1410.....	102	Lithium aluminium hydride.	UN 1459.....	102	Chlorate and magnesium chloride.
UN 1410.....	101	Lithium aluminum hydnde.	UN 1459.....	101	Chlorate and magnesium chloride mixture.
UN 1411.....	102	Lithium aluminium hydride.	UN 1461.....	101	Chlorate, n.o.s.
UN 1411.....	101	Lithium aluminum hydride, ethereal.	NA 1461.....	101	Chlorate, n.o.s., wet.
UN 1412.....	102	Lithium amide.	UN 1461.....	102	Chlorates.
UN 1412.....	101	Lithium amide, powdered.	UN 1462.....	102	Chlorites.
UN 1413.....	101	Lithium borohydride.	NA 1463.....	101	Chromic acid mixture, dry.
			NA 1463.....	101	Chromic acid, solid.
			UN 1463.....	102	Chromium trioxide.
			UN 1464.....	102	Dichromates.
			UN 1465.....	102	Didymium nitrate.

ILLINOIS HAZARDOUS MATERIALS TRANSPORTATION REGULATIONS

App. A

(1)— Identification Number	(2)— Source 172.***	(3)—Description	(1)— Identification Number	(2)— Source 172.***	(3)—Description
UN 1466.....	101	Ferric nitrate.	UN 1516.....	101	Zinc peroxide.
UN 1467.....	101	Guanidine nitrate.	UN 1517.....	102	Zirconium picramate.
UN 1469.....	101	Lead nitrate.	UN 1517.....	101	Zirconium picramate, wet.
UN 1470.....	102	Lead perchlorate.	UN 1541.....	101	Acetone cyanohydrin.
UN 1471.....	102	Lithium hypochlorite.	UN 1542.....	102	Aldrin.
UN 1471.....	101	Lithium hypochlorite compound, dry.	UN 1544.....	102	Alkaloids.
UN 1472.....	101	Lithium peroxide.	UN 1545.....	102	Allyl isothiocyanate.
UN 1473.....	102	Magnesium bromate.	UN 1546.....	102	Ammonium arsenate.
UN 1474.....	101	Magnesium nitrate.	UN 1546.....	101	Ammonium arsenate, solid.
UN 1475.....	101	Magnesium perchlorate.	UN 1547.....	102	Aniline.
UN 1476.....	102	Magnesium peroxide.	UN 1547.....	101	Aniline oil, liquid.
UN 1476.....	101	Magnesium peroxide, solid.	UN 1548.....	102	Aniline hydrochloride.
NA 1477.....	101	Ammonium sulfate nitrate.	UN 1549.....	102	Antimony compounds.
NA 1477.....	101	Nitrate, n.o.s.	NA 1549.....	101	Antimony tribromide, solid.
UN 1477.....	102	Nitrates.	NA 1549.....	101	Antimony tribromide solution.
UN 1478.....	102	Sodium nitrate and potash.	NA 1549.....	101	Antimony trifluoride, solid.
NA 1479.....	101	Compound, tree or weed killing, solid.	NA 1549.....	101	Antimony trifluoride solution.
NA 1479.....	101	Cosmetics, n.o.s.	UN 1550.....	102	Antimony lactate.
NA 1479.....	101	Cupric nitrate.	UN 1550.....	101	Antimony lactate, solid.
NA 1479.....	101	Drugs, n.o.s.	UN 1551.....	102	Antimony potassium tartrate.
NA 1479.....	101	Manganese dioxide.	UN 1551.....	101	Antimony potassium tartrate, solid.
UN 1479.....	101	Oxidizer, n.o.s. or Oxidizing materi- al, n.o.s.	UN 1553.....	102	Arsenic acid.
UN 1479.....	102	Oxidizing substances, n.o.s.	UN 1553.....	101	Arsenic acid solution.
NA 1479.....	101	Potassium dichromate.	UN 1554.....	102	Arsenic acid.
NA 1479.....	101	Sodium dichromate.	UN 1554.....	101	Arsenic acid, solid.
UN 1480.....	102	Perborates.	UN 1555.....	102	Arsenic bromide.
NA 1481.....	101	Perchlorate, n.o.s.	UN 1555.....	101	Arsenic bromide, solid.
UN 1481.....	102	Perchlorates.	UN 1556.....	101	Arsenical compound, liquid, n.o.s., or Arsenical mixture, liquid, n.o.s.
NA 1482.....	101	Permanganate, n.o.s.	UN 1556.....	102	Arsenic compounds.
UN 1482.....	102	Permanganates.	NA 1556.....	101	Methyldichloroarsine.
UN 1483.....	102	Peroxides.	NA 1556.....	101	Phenyldichloroarsine.
UN 1484.....	101	Potassium bromate.	UN 1557.....	101	Arsenical compound, solid, n.o.s., or Arsenical mixture, solid, n.o.s.
UN 1485.....	101	Potassium chlorate.	UN 1557.....	101	Arsenical dip, liquid.
UN 1486.....	101	Potassium nitrate.	UN 1557.....	102	Arsenic compounds.
UN 1487.....	102	Potassium nitrate and sodium ni- trite.	NA 1557.....	101	Arsenic compounds.
UN 1487.....	101	Sodium nitrite mixed with potassium nitrate.	NA 1557.....	101	Arsenic iodide, solid.
NA 1487.....	101	Sodium nitrite mixture.	NA 1557.....	101	Arsenic sulfide, solid.
UN 1488.....	101	Potassium nitrite.	NA 1557.....	101	Arsenic trisulfide.
UN 1489.....	101	Potassium perchlorate.	UN 1558.....	102	Arsenic, metallic.
UN 1490.....	101	Potassium permanganate.	UN 1558.....	101	Arsenic, solid.
UN 1491.....	101	Potassium peroxide.	UN 1559.....	102	Arsenic pentoxide.
UN 1492.....	102	Potassium persulphate.	UN 1559.....	101	Arsenic pentoxide, solid.
UN 1493.....	101	Silver nitrate.	UN 1560.....	102	Arsenic trichloride.
UN 1494.....	101	Sodium bromate.	UN 1560.....	101	Arsenic trichloride, liquid.
UN 1495.....	101	Sodium chlorate.	UN 1561.....	102	Arsenic trioxide.
UN 1496.....	101	Sodium chlorite.	UN 1561.....	101	Arsenic trioxide, solid.
UN 1498.....	101	Sodium nitrate.	UN 1562.....	101	Arsenical dust.
UN 1499.....	102	Sodium nitrate and potassium ni- trate.	UN 1564.....	102	Banum compounds, n.o.s.
UN 1500.....	101	Sodium nitrite.	UN 1565.....	102	Banum cyanide.
UN 1502.....	101	Sodium perchlorate.	UN 1565.....	101	Barium cyanide, solid.
UN 1503.....	101	Sodium permanganate.	NA 1566.....	101	Beryllium chloride.
UN 1504.....	101	Sodium peroxide.	UN 1566.....	101	Beryllium compound, n.o.s.
UN 1505.....	102	Sodium persulphate.	UN 1566.....	102	Beryllium compounds.
UN 1506.....	101	Strontium chlorate.	NA 1566.....	101	Beryllium fluoride.
UN 1506.....	101	Strontium chlorate, wet.	UN 1567.....	102	Beryllium.
UN 1507.....	101	Strontium nitrate.	UN 1568.....	102	Bordeaux arsenites.
UN 1508.....	102	Strontium perchlorate.	UN 1569.....	102	Bromoacetone.
UN 1509.....	101	Strontium peroxide.	UN 1569.....	101	Bromoacetone, liquid.
UN 1510.....	101	Tetranitromethane.	UN 1570.....	102	Brucine.
UN 1511.....	102	Urea hydrogen peroxide.	UN 1570.....	101	Brucine, solid.
NA 1511.....	101	Urea peroxide.	UN 1571.....	102	Banum azide.
UN 1512.....	101	Zinc ammonium nitrite.	UN 1571.....	101	Banum azide, wet.
UN 1513.....	101	Zinc chlorate.	UN 1572.....	102	Cacodylic acid.
UN 1514.....	101	Zinc nitrate.	UN 1573.....	102	Calcium arsenate.
UN 1515.....	101	Zinc permanganate.	UN 1573.....	101	Calcium arsenate, solid.
			UN 1574.....	102	Calcium arsenate and arsenite.
			NA 1574.....	101	Calcium arsenite, solid.
			UN 1575.....	102	Calcium cyanide.
			UN 1575.....	101	Calcium cyanide, solid or Calcium cyanide mixture, solid.

ILLINOIS HAZARDOUS MATERIALS TRANSPORTATION REGULATIONS

App. A

(1)— Identification Number	(2)— Source 172.***	(3)—Description	(1)— Identification Number	(2)— Source 172.***	(3)—Description
UN 1577.....	102	Chlorodinitrobenzene.	UN 1613.....	102	Hydrocyanic acid.
UN 1577.....	101	Dinitrochlorobenzene.	UN 1613.....	101	Hydrocyanic acid solution.
UN 1578.....	102	Chloronitrobenzenes.	UN 1613.....	101	Hydrocyanic acid solution, less than 5% hydrocyanic acid.
UN 1578.....	101	Nitrochlorobenzene, meta or para, solid.	UN 1614.....	102	Hydrogen cyanide.
UN 1578.....	101	Nitrochlorobenzene, ortho, liquid.	UN 1615.....	102	Insecticides, n.o.s.
UN 1579.....	102	4-Chloro-o-toluidine hydrochloride.	UN 1616.....	101	Lead acetate.
UN 1579.....	101	4-Chloro-o-toluidine hydrochloride.	UN 1617.....	102	Lead arsenates.
UN 1580.....	102	Chloropicrin.	UN 1617.....	101	Lead arsenate, solid.
UN 1580.....	101	Chloropicrin, liquid.	UN 1618.....	102	Lead arsenites.
UN 1581.....	102	Chloropicrin and methyl bromide.	UN 1618.....	101	Lead arsenite, solid.
NA 1581.....	101	Methyl bromide and more than 2% chloropicrin mixture, liquid.	UN 1620.....	101	Lead cyanide.
UN 1582.....	102	Chloropicrin and methyl chloride.	UN 1621.....	102	London purple.
UN 1582.....	101	Chloropicrin and methyl chloride mixture.	UN 1621.....	101	London purple, solid.
NA 1583.....	101	Chloropicrin, absorbed.	UN 1622.....	102	Magnesium arsenate.
UN 1583.....	101	Chloropicrin mixture.	UN 1622.....	101	Magnesium arsenate, solid.
UN 1583.....	102	Chloropicrin mixtures, n.o.s.	UN 1623.....	102	Mercuric arsenate.
UN 1584.....	102	Cocculus.	UN 1624.....	102	Mercuric chloride.
UN 1584.....	101	Cocculus, solid.	UN 1624.....	101	Mercuric chloride, solid.
UN 1585.....	102	Copper acetoarsenite.	UN 1625.....	101	Mercuric nitrate.
UN 1585.....	101	Copper acetoarsenite, solid.	UN 1626.....	102	Mercuric potassium cyanide.
UN 1586.....	102	Copper arsenite.	UN 1626.....	101	Mercuric potassium cyanide, solid.
UN 1586.....	101	Copper arsenite, solid.	UN 1627.....	101	Mercurous nitrate, solid.
UN 1587.....	101	Copper cyanide.	UN 1628.....	101	Mercurous sulfate, solid.
UN 1588.....	101	Cyanide or cyanide mixture, dry.	UN 1628.....	102	Mercurous sulphate.
UN 1588.....	102	Cyanides.	UN 1629.....	101	Mercuric acetate.
UN 1589.....	101	Cyanogen chloride.	UN 1629.....	101	Mercurous acetate, solid.
UN 1590.....	102	Dichloroanilines.	UN 1629.....	102	Mercury acetate.
UN 1591.....	101	Dichlorobenzene, ortho, liquid.	UN 1630.....	101	Mercury ammonium chloride, solid.
UN 1591.....	102	Dichlorobenzenes.	UN 1630.....	102	Mercury ammonium chloride.
UN 1592.....	101	Dichlorobenzene, para, solid.	UN 1631.....	101	Mercuric benzoate, solid.
UN 1592.....	102	p-Dichlorobenzene.	UN 1631.....	102	Mercuric benzoate.
UN 1593.....	102	Dichloromethane.	UN 1633.....	102	Mercury bisulphate.
UN 1593.....	101	Dichloromethane or Methylene chloride.	UN 1634.....	101	Mercuric bromide, solid.
UN 1594.....	102	Diethyl sulphate.	UN 1634.....	101	Mercurous bromide, solid.
UN 1595.....	101	Dimethyl sulfate.	UN 1634.....	102	Mercury bromides.
UN 1595.....	102	Dimethyl sulphate.	UN 1636.....	101	Mercuric cyanide, solid.
UN 1596.....	102	Dinitroanilines.	UN 1636.....	102	Mercury cyanide.
UN 1597.....	102	Dinitrobenzenes.	UN 1637.....	101	Mercurous gluconate, solid.
UN 1597.....	101	Dinitrobenzene, solid, or Dinitroben- zol, solid.	UN 1637.....	102	Mercury gluconate.
UN 1597.....	101	Dinitrobenzene solution.	UN 1638.....	101	Mercuric iodide, solid.
UN 1598.....	102	4,6-Dinitro-o-cresol.	UN 1638.....	101	Mercuric iodide, solution.
UN 1599.....	102	Dinitrophenol.	UN 1638.....	101	Mercurous iodide, solid.
UN 1599.....	101	Dinitrophenol solution.	UN 1638.....	102	Mercury iodide.
UN 1600.....	101	Dinitrotoluene, liquid.	UN 1639.....	101	Mercuric or Mercury nucleate, solid.
UN 1600.....	102	Dinitrotoluenes.	UN 1639.....	102	Mercury nucleate.
UN 1601.....	101	Disinfectant, liquid.	UN 1640.....	101	Mercuric oleate, solid.
UN 1601.....	102	Disinfectants.	UN 1640.....	102	Mercury oleate.
UN 1601.....	101	Disinfectant, solid.	UN 1641.....	101	Mercuric oxide, solid.
(UN 1601).....	102	Germicides.	UN 1641.....	102	Mercurous oxide, black, solid.
UN 1602.....	102	Dye intermediates.	UN 1641.....	101	Mercury oxide.
UN 1603.....	102	Ethyl bromoacetate.	UN 1642.....	101	Mercuric oxycyanide, solid.
UN 1604.....	101	Ethylenediamine.	UN 1642.....	102	Mercury oxycyanide.
UN 1605.....	101	Ethylene dibromide.	UN 1643.....	101	Mercuric potassium iodide, solid.
UN 1606.....	102	Ferric arsenate.	UN 1643.....	102	Mercury potassium iodide.
UN 1606.....	101	Ferric arsenate, solid.	UN 1644.....	101	Mercuric salicylate solid.
UN 1607.....	102	Ferric arsenite.	UN 1644.....	102	Mercury salicylate.
UN 1607.....	101	Ferric arsenite, solid.	UN 1645.....	101	Mercuric sulfate, solid.
UN 1608.....	102	Ferrous arsenate.	UN 1645.....	102	Mercuric sulphate.
UN 1608.....	101	Ferrous arsenate, solid.	UN 1646.....	101	Mercuric sulfocyanate, solid or Mer- curic thiocyanate, solid.
UN 1609.....	102	Fungicides.	UN 1646.....	102	Mercury thiocyanate.
UN 1610.....	102	Halogenated imitating liquids, n.o.s.	UN 1647.....	102	Methyl bromide and ethylene dibro- mide.
UN 1611.....	102	Hexaethyl tetraphosphate.	UN 1647.....	101	Methyl bromide-ethylene dibromide mixture, liquid.
UN 1611.....	101	Hexaethyl tetraphosphate, liquid.	NA 1648.....	101	Acetonitrile.
UN 1612.....	102	Hexaethyl tetraphosphate.	UN 1648.....	102	Methyl cyanide.
UN 1612.....	101	Hexaethyl tetraphosphate and com- pressed gas mixture.	UN 1649.....	101	Motor fuel antiknock compound or Antiknock compound.
			UN 1649.....	102	Motor fuel anti-knock mixtures.

ILLINOIS HAZARDOUS MATERIALS TRANSPORTATION REGULATIONS

App. A

(1)— Identification Number	(2)— Source 172.***	(3)—Description	(1)— Identification Number	(2)— Source 172.***	(3)—Description
NA 1649.....	101	Tetraethyl lead, liquid.	UN 1695.....	101	Monochloroacetone, stabilized <i>or</i> inhibited.
UN 1650.....	102	Naphthylamine.	UN 1697.....	102	Chloroacetophenone.
UN 1651.....	102	alpha-Naphthylthiourea.	UN 1697.....	101	Chloroacetophenone, gas, liquid, <i>or</i> solid.
UN 1652.....	102	Naphthylurea.	UN 1698.....	101	Diphenylaminechloroarsine.
UN 1653.....	102	Nickel cyanide.	UN 1699.....	102	Diphenylchloroarsine.
UN 1653.....	101	Nickel cyanide, solid.	UN 1700.....	101	Tear gas candle.
UN 1654.....	102	Nicotine.	UN 1700.....	102	Tear gas candles.
UN 1654.....	101	Nicotine, liquid.	UN 1701.....	101	Xyli bromide.
UN 1655.....	102	Nicotine.	UN 1702.....	102	1,1,2,2-Tetrachloroethane.
UN 1656.....	101	Nicotine hydrochloride.	UN 1702.....	101	Tetrachloroethane.
UN 1657.....	101	Nicotine salicylate.	UN 1703.....	102	Tetraethyl dithiopyrophosphate.
UN 1658.....	101	Nicotine sulfate, liquid.	UN 1703.....	101	Tetraethyl dithiopyrophosphate and compressed gas mixture.
UN 1658.....	101	Nicotine sulfate, solid.	UN 1704.....	102	Tetraethyl dithiopyrophosphate.
UN 1658.....	102	Nicotine sulphate.	UN 1704.....	101	Tetraethyl dithiopyrophosphate, liquid.
UN 1659.....	101	Nicotine tartrate.	UN 1704.....	101	Tetraethyl dithiopyrophosphate mixture, dry.
UN 1660.....	101	Nitric oxide.	UN 1704.....	101	Tetraethyl dithiopyrophosphate mixture, liquid.
UN 1661.....	101	Nitroaniline.	UN 1705.....	102	Tetraethyl pyrophosphate and compressed gas.
UN 1661.....	102	Nitroanilines.	UN 1705.....	101	Tetraethyl pyrophosphate and compressed gas mixture.
UN 1662.....	102	Nitrobenzene.	UN 1707.....	102	Thallium compounds.
UN 1662.....	101	Nitrobenzene, liquid <i>or</i> Nitrobenzol, liquid.	NA 1707.....	101	Thallium salt, solid, n.o.s.
UN 1663.....	101	Nitrophenol.	NA 1707.....	101	Thallium sulfate, solid.
UN 1663.....	102	Nitrophenols.	UN 1708.....	102	Toluidines.
UN 1664.....	101	Nitrotoluene.	UN 1709.....	102	2,4-Toluylenediamine.
UN 1664.....	102	Nitrotoluenes.	NA 1709.....	101	Toluenediamine.
UN 1665.....	102	Nitroxyls.	UN 1710.....	101	Trichloroethylene.
NA 1665.....	101	Nitroxylol.	UN 1711.....	102	Xylidines.
UN 1668.....	102	Parathion.	UN 1712.....	101	Zinc arsenate.
UN 1669.....	102	Pentachloroethane.	UN 1712.....	102	Zinc arsenate and arsenite.
UN 1670.....	101	Perchloromethyl mercaptan.	UN 1712.....	101	Zinc arsenite, solid.
UN 1670.....	102	Perchloromethyl-mercaptan.	UN 1713.....	101	Zinc cyanide.
UN 1671.....	101	Phenol.	UN 1714.....	101	Zinc phosphide.
UN 1672.....	102	Phenylcarbylamine chloride.	UN 1715.....	101	Acetic anhydride.
UN 1673.....	101	Phenylenediamine, meta <i>or</i> para, solid.	UN 1716.....	101	Acetyl bromide.
UN 1673.....	102	Phenylenediamines.	UN 1717.....	101	Acetyl chloride.
UN 1674.....	102	Phenylmercuric acetate.	UN 1718.....	101	Acid butyl phosphate.
UN 1677.....	102	Potassium arsenate.	NA 1719.....	101	Alkaline liquid, n.o.s.
UN 1677.....	101	Potassium arsenate, solid.	UN 1719.....	102	Caustic alkali liquids, n.o.s.
UN 1678.....	102	Potassium arsenite.	UN 1722.....	101	Allyl chlorocarbonate.
UN 1678.....	101	Potassium arsenite, solid.	UN 1722.....	102	Allyl chloroformate.
UN 1679.....	102	Potassium cuprocyanide.	UN 1723.....	102	Allyl iodide.
UN 1680.....	102	Potassium cyanide.	UN 1724.....	101	Allyl trichlorosilane.
UN 1680.....	101	Potassium cyanide, solid.	UN 1725.....	102	Aluminium bromide.
UN 1680.....	101	Potassium cyanide solution.	UN 1725.....	101	Aluminum bromide, anhydrous.
UN 1681.....	102	Rodenticides, n.o.s.	UN 1726.....	102	Aluminium chloride.
UN 1682.....	102	Sheep dips.	UN 1727.....	102	Ammonium hydrogen fluoride.
UN 1683.....	102	Silver arsenite.	UN 1727.....	101	Ammonium hydrogen fluoride, solid.
UN 1684.....	101	Silver cyanide.	UN 1728.....	102	Amyl trichlorosilane.
UN 1685.....	101	Sodium arsenate.	UN 1728.....	101	Amyl trichlorosilane.
UN 1686.....	102	Sodium arsenite.	UN 1729.....	101	Anisoyl chloride.
UN 1686.....	101	Sodium arsenite, liquid.	UN 1730.....	101	Antimony pentachloride.
UN 1687.....	101	Sodium azide.	UN 1731.....	102	Antimony pentachloride.
UN 1688.....	102	Sodium cacodylate.	UN 1731.....	101	Antimony pentachloride solution.
UN 1689.....	102	Sodium cyanide.	UN 1732.....	101	Antimony pentafluoride.
UN 1689.....	101	Sodium cyanide, solid.	UN 1733.....	102	Antimony trichloride.
UN 1689.....	101	Sodium cyanide solution.	UN 1733.....	101	Antimony trichloride, solid.
UN 1690.....	102	Sodium fluoride.	UN 1733.....	101	Antimony trichloride solution.
UN 1690.....	101	Sodium fluoride, solid.	UN 1734.....	102	Batteries.
UN 1690.....	101	Sodium fluoride, solution.	UN 1735.....	102	Battery fluid.
UN 1691.....	102	Strontium arsenite.	UN 1736.....	101	Benzoyl chloride.
UN 1691.....	101	Strontium arsenite, solid.	UN 1737.....	101	Benzyl bromide.
UN 1692.....	102	Strychnine.	UN 1738.....	101	Benzyl chloride.
UN 1692.....	101	Strychnine salt, solid.	UN 1739.....	101	Benzyl chloroformate.
UN 1692.....	101	Strychnine, solid.	UN 1740.....	102	Bifluorides, n.o.s.
NA 1693.....	101	Imitating agent, n.o.s.			
NA 1693.....	101	ORM-A, n.o.s.			
UN 1693.....	102	Tear gas.			
UN 1694.....	102	Bromobenzyl cyanide.			
UN 1695.....	102	Chloroacetone.			

ILLINOIS HAZARDOUS MATERIALS TRANSPORTATION REGULATIONS

App. A

(1)— Identification Number	(2)— Source 172.***	(3)—Description	(1)— Identification Number	(2)— Source 172.***	(3)—Description
UN 1741.....	101	Boron trichloride.	NA 1760.....	101	Isopentanoic acid.
UN 1742.....	102	Boron trifluoride acetic acid com- plex.	NA 1760.....	101	Memtetrahydro phthalic anhydride.
UN 1742.....	101	Boron trifluoride-acetic acid com- plex.	NA 1760.....	101	Methyl phosphonothioic dichloride, anhydrous.
UN 1743.....	102	Boron trifluoride propionic acid complex.	NA 1760.....	101	Morpholine, aqueous, mixture.
UN 1744.....	101	Bromine.	NA 1760.....	101	Nitric acid, 40% or less.
UN 1745.....	101	Bromine pentafluoride.	NA 1760.....	101	ORM-B, n.o.s.
UN 1746.....	101	Bromine trifluoride.	NA 1760.....	101	Textile treating compound or mix- ture, liquid.
UN 1747.....	101	Butyl trichlorosilane.	NA 1760.....	101	Titanium sulfate solution.
UN 1748.....	102	Calcium hypochlorite.	NA 1760.....	101	Valenc acid.
UN 1748.....	101	Calcium hypochlorite mixture.	NA 1760.....	101	Water treatment compounds, liquid.
UN 1749.....	101	Chlorine trifluoride.	UN 1761.....	102	White acid.
UN 1750.....	102	Chloroacetic acid.	UN 1761.....	101	Cupriethylenediamine.
UN 1750.....	101	Chloroacetic acid, liquid or solution.	UN 1762.....	101	Cupriethylene-diamine solution.
UN 1751.....	102	Chloroacetic acid.	UN 1762.....	101	Cyclohexenyl trichlorosilane.
UN 1751.....	101	Chloroacetic acid, solid.	UN 1763.....	101	Cyclohexyl trichlorosilane.
UN 1752.....	101	Chloroacetyl chloride.	UN 1764.....	101	Dichloroacetic acid.
UN 1753.....	102	Chlorophenyl trichlorosilane.	UN 1765.....	101	Dichloroacetyl chloride.
UN 1753.....	101	Chlorophenyltrichlorosilane.	UN 1766.....	102	Dichlorophenyl trichlorosilane.
UN 1754.....	101	Chlorosulfonic acid.	UN 1766.....	101	Dichlorophenyltrichlorosilane.
UN 1754.....	101	Chlorosulfonic acid-sulfur trioxide mixture.	UN 1767.....	101	Diethyl dichlorosilane.
UN 1754.....	102	Chlorosulphonic acid.	UN 1768.....	102	Diffuorophosphoric acid.
UN 1754.....	102	Dichloroacetyl chloride.	UN 1768.....	101	Diffuorophosphoric acid, anhydrous.
UN 1755.....	102	Chromic acid.	UN 1769.....	101	Diphenyl dichlorosilane.
UN 1755.....	101	Chromic acid solution.	UN 1770.....	102	Diphenylmethyl bromide.
UN 1756.....	102	Chromic fluoride.	UN 1770.....	101	Diphenyl methyl bromide, solid.
UN 1756.....	101	Chromic fluoride, solid.	UN 1771.....	101	Diphenyl methyl bromide solution.
UN 1757.....	102	Chromic fluoride.	UN 1771.....	101	Dodecyl trichlorosilane.
UN 1757.....	101	Chromic fluoride solution.	UN 1773.....	102	Ferric chloride.
UN 1758.....	102	Chromium oxychloride.	UN 1773.....	101	Ferric chloride, solid.
UN 1758.....	101	Chromium oxychloride or Chromyl chloride.	UN 1774.....	101	Fire extinguisher charge containing sulfuric acid.
UN 1759.....	102	Cleaning compounds.	UN 1774.....	102	Fire extinguisher charges.
UN 1759.....	101	Corrosive solid, n.o.s.	UN 1775.....	101	Fluoboric acid.
(UN 1759).....	102	Corrosive solids, n.o.s.	UN 1776.....	102	Fluorophosphoric acid.
NA 1759.....	101	Cosmetics, solid, n.o.s.	UN 1776.....	101	Monofluorophosphoric acid, anhy- drous.
NA 1759.....	101	Drugs, n.o.s. solid.	UN 1777.....	101	Fluorosulfonic acid or Fluosulfonic acid.
NA 1759.....	101	Ferrous chloride, solid.	UN 1777.....	102	Fluorosulphonic acid.
NA 1759.....	101	Stannous chloride, solid.	UN 1778.....	102	Fluosilicic acid.
NA 1760.....	101	Acid, liquid, n.o.s.	NA 1778.....	101	Hydrofluorosilicic acid.
UN 1760.....	102	Alkaline corrosive liquids, n.o.s.	UN 1779.....	101	Formic acid.
NA 1760.....	101	Aluminum phosphate solution.	UN 1779.....	101	Formic acid solution.
NA 1760.....	101	Aluminum sulfate solution.	UN 1780.....	101	Fumaryl chloride.
NA 1760.....	101	2-(2-Aminoethoxy) ethanol.	UN 1781.....	102	Hexadecyl trichlorosilane.
NA 1760.....	101	Aminopropylidiethanolamine.	UN 1781.....	101	Hexadecyltrichlorosilane.
NA 1760.....	101	N-Aminopropylmorpholine.	UN 1782.....	101	Hexafluorophosphoric acid.
NA 1760.....	101	bis (Aminopropyl) piperazine.	UN 1783.....	102	Hexamethylenediamine.
NA 1760.....	101	Boiler compound, liquid.	UN 1783.....	101	Hexamethylenediamine, solution.
NA 1760.....	101	Chemical kit.	UN 1784.....	102	Hexyl trichlorosilane.
NA 1760.....	101	Compound, cleaning, liquid.	UN 1784.....	101	Hexyltrichlorosilane.
NA 1760.....	101	Compound, lacquer, paint, or var- nish removing, liquid.	UN 1786.....	102	Acid mixtures.
NA 1760.....	101	Compound, rust preventing or Com- pound, rust removing.	UN 1786.....	101	Hydrofluoric and sulfuric acid mix- ture.
NA 1760.....	101	Compound, tree or weed killing, liquid.	UN 1787.....	101	Hydrodic acid.
NA 1760.....	101	Compound, vulcanizing, liquid.	UN 1788.....	101	Hydrobromic acid.
UN 1760.....	101	Corrosive liquid, n.o.s.	UN 1788.....	101	Hydrobromic acid not more than 49% strength.
UN 1760.....	102	Corrosive liquids, n.o.s.	NA 1789.....	101	Compound, cleaning, liquid (con- taining hydrochloric (muriatic) acid).
NA 1760.....	101	Cosmetics, liquid, n.o.s.	UN 1789.....	101	Hydrochloric acid.
NA 1760.....	101	2,2-Dichloropropionic acid.	NA 1789.....	101	Hydrochloric acid mixture.
NA 1760.....	101	Drugs, n.o.s. liquid.	UN 1789.....	101	Hydrochloric acid solution, inhibited.
NA 1760.....	101	Ethyl phosphonothioic dichloride, anhydrous.	NA 1790.....	101	Compound, cleaning, liquid (con- taining hydrofluoric acid).
NA 1760.....	101	Ethyl phosphorodichloride.	NA 1790.....	101	Etching acid, liquid, n.o.s.
NA 1760.....	101	Ferrous chloride, solution.	UN 1790.....	102	Hydrofluoric acid.
NA 1760.....	101	Flame retardant compound liquid.	UN 1790.....	101	Hydrofluoric acid solution.
NA 1760.....	101	Hexanoic acid.			

App. A

(1)— Identification Number	(2)— Source 172.***	(3)—Description	(1)— Identification Number	(2)— Source 172.***	(3)—Description
UN 1791.....	102	Hypochlorite.	UN 1829.....	101	Sulfur trioxide.
UN 1791.....	101	Hypochlorite solution.	UN 1829.....	102	Sulphur trioxide.
NA 1791.....	101	Hypochlorite solution containing not more than 7% available chlorine.	UN 1830.....	101	Sulfonic acid.
UN 1792.....	101	Iodine monochloride.	UN 1830.....	102	Sulphuric acid.
UN 1793.....	102	Isopropyl acid phosphate.	NA 1831.....	101	Oleum.
UN 1793.....	101	Isopropyl acid phosphate, solid.	UN 1831.....	102	Sulphuric acid.
NA 1794.....	101	Lead dross.	UN 1832.....	101	Sulfonic acid, spent.
UN 1794.....	101	Lead sulfate, solid.	UN 1832.....	102	Sulphuric acid.
UN 1794.....	102	Lead sulphate.	UN 1833.....	101	Sulfurous acid.
UN 1796.....	102	Acid mixtures.	UN 1833.....	102	Sulphurous acid.
NA 1796.....	101	Nitrating acid.	UN 1834.....	101	Sulfuryl chloride.
UN 1798.....	101	Nitrohydrochloric acid.	UN 1834.....	102	Sulphuryl chloride.
UN 1798.....	101	Nitrohydrochloric acid, diluted.	UN 1835.....	102	Tetramethylammonium hydroxide.
UN 1799.....	102	Nonyl trichlorosilane.	UN 1835.....	101	Tetramethylammonium hydroxide, liquid.
UN 1799.....	101	Nonyltrichlorosilane.	UN 1836.....	101	Thionyl chloride.
UN 1800.....	102	Octadecyl trichlorosilane.	UN 1837.....	101	Thiophosphoryl chloride.
UN 1800.....	101	Octadecyltrichlorosilane.	UN 1838.....	101	Titanium tetrachloride.
UN 1801.....	102	Octyl trichlorosilane.	UN 1839.....	102	Trichloroacetic acid.
UN 1801.....	101	Octyltrichlorosilane.	UN 1839.....	101	Trichloroacetic acid, solid.
UN 1802.....	102	Perchloric acid.	UN 1840.....	102	Zinc chloride.
UN 1802.....	101	Perchloric acid, not over 50% acid.	UN 1840.....	101	Zinc chloride solution.
UN 1803.....	102	Phenolsulphonic acid.	UN 1841.....	101	Acetaldehyde ammonia.
UN 1804.....	102	Phenyl trichlorosilane.	UN 1842.....	102	Acetic acid.
UN 1804.....	101	Phenyltrichlorosilane.	UN 1843.....	102	Ammonium dinitro-3-cresolate.
UN 1805.....	102	o-Phosphoric acid.	UN 1845.....	101	Carbon dioxide, solid, or Dry ice, or Carbonic.
UN 1805.....	101	Phosphoric acid.	UN 1846.....	101	Carbon tetrachloride.
UN 1806.....	102	Phosphorus pentachloride.	UN 1847.....	102	Potassium sulphide.
UN 1806.....	101	Phosphorus pentachloride, solid.	UN 1848.....	101	Propionic acid.
NA 1807.....	101	Phosphoric anhydride.	UN 1848.....	101	Propionic acid, solution.
UN 1807.....	102	Phosphorus pentoxide.	UN 1849.....	102	Sodium sulphide.
UN 1808.....	101	Phosphorus tribromide.	UN 1850.....	101	Eradicator, paint or grease, liquid.
UN 1809.....	101	Phosphorus trichloride.	UN 1850.....	102	Eradicators.
UN 1810.....	101	Phosphorus oxychloride.	UN 1851.....	101	Medicines, n.o.s.
UN 1810.....	102	Phosphoryl chloride.	UN 1851.....	101	Medicines, n.o.s., liquid.
UN 1811.....	102	Potassium bifluoride.	UN 1851.....	101	Medicines, n.o.s., solid.
NA 1811.....	101	Potassium hydrogen fluoride solu- tion.	UN 1854.....	102	Banum alloys.
UN 1812.....	101	Potassium fluoride.	UN 1855.....	102	Calcium.
UN 1812.....	101	Potassium fluoride solution.	UN 1856.....	102	Rags.
UN 1813.....	102	Potassium hydroxide.	UN 1856.....	101	Rags, oily.
UN 1813.....	101	Potassium hydroxide, dry solid, flake, bead, or granular.	UN 1857.....	102	Textile waste.
UN 1814.....	102	Potassium hydroxide.	UN 1857.....	101	Textile waste, wet.
UN 1814.....	101	Potassium hydroxide, liquid or solu- tion.	UN 1857.....	101	Waste textile, wet.
UN 1815.....	102	Propionyl chloride.	UN 1858.....	101	Hexafluoropropylene.
UN 1816.....	101	Propyl trichlorosilane.	UN 1859.....	101	Silicon tetrafluoride.
UN 1817.....	101	Pyrosulphuryl chloride.	UN 1860.....	102	Vinyl fluoride.
UN 1817.....	102	Pyrosulphuryl chloride.	UN 1860.....	101	Vinyl fluoride, inhibited.
UN 1818.....	101	Silicon chloride or Silicon tetrachlo- ride.	UN 1862.....	101	Ethyl crotonate.
UN 1818.....	102	Silicon tetrachloride.	UN 1863.....	102	Fuel, aviation.
UN 1819.....	102	Sodium aluminate.	UN 1863.....	101	Fuel, aviation, turbine engine.
UN 1819.....	101	Sodium aluminate solution.	UN 1864.....	102	Gas dnps.
UN 1821.....	101	Sodium hydrogen sulfate, solid.	UN 1864.....	101	Gas dnps, hydrocarbon.
UN 1821.....	102	Sodium hydrogen sulphate.	UN 1865.....	102	n-Propyl nitrate.
UN 1823.....	102	Sodium hydroxide.	UN 1866.....	102	Resin.
UN 1823.....	101	Sodium hydroxide, dry solid, flake, bead, or granular.	UN 1866.....	101	Resin solution.
UN 1824.....	102	Sodium hydroxide.	UN 1867.....	102	Cigarettes.
UN 1824.....	101	Sodium hydroxide, liquid or solu- tion.	UN 1867.....	101	Self-lighting cigarette.
UN 1825.....	102	Sodium monoxide.	UN 1868.....	101	Decaborane.
UN 1825.....	101	Sodium monoxide, solid.	UN 1869.....	102	Magnesium.
UN 1826.....	102	Acid mixtures.	UN 1869.....	102	Magnesium alloys.
NA 1826.....	101	Nitrating acid, spent.	UN 1869.....	101	Magnesium, metal.
UN 1827.....	102	Stannic chloride.	NA 1869.....	101	Magnesium scrap.
UN 1827.....	101	Tin tetrachloride, anhydrous.	UN 1870.....	102	Potassium borohydride.
UN 1828.....	101	Sulfur chloride.	UN 1871.....	102	Titanium hydride.
UN 1828.....	102	Sulphur chlorides.	UN 1872.....	102	Lead dioxide.
			UN 1872.....	101	Lead peroxide.
			UN 1873.....	101	Perchloric acid.
			UN 1884.....	101	Banum oxide.
			UN 1885.....	101	Benzidine.
			UN 1886.....	102	Benzylidene chloride.

App. A

(1)— Identification Number	(2)— Source 172.***	(3)—Description	(1)— Identification Number	(2)— Source 172.***	(3)—Description
UN 1887.....	101	Bromochloromethane.	UN 1942.....	101	Ammonium nitrate (no organic coat- ing).
UN 1888.....	101	Chloroform.	NA 1942.....	101	Ammonium nitrate (organic coat- ing).
UN 1889.....	101	Cyanogen bromide.	UN 1944.....	102	Matches.
UN 1891.....	102	Ethyl bromide.	UN 1944.....	101	Matches, safety.
UN 1892.....	102	Ethyl dichloroarsine.	UN 1945.....	102	Matches.
UN 1893.....	102	Organophosphates.	UN 1950.....	102	Aerosol dispensers.
UN 1894.....	102	Phenylmercuric hydroxide.	UN 1951.....	102	Argon.
UN 1895.....	102	Phenylmercuric nitrate.	UN 1951.....	101	Argon, liquid pressurized.
UN 1897.....	102	Tetrachloroethylene.	UN 1952.....	102	Ethylene oxide and carbon dioxide.
UN 1897.....	101	Tetrachloroethylene or Perchlor- oethylene.	UN 1953.....	102	Compressed or liquefied gases.
UN 1898.....	101	Acetyl iodide.	(UN 1953).....	102	Stibine.
UN 1899.....	102	Alkanesulphonic acids.	(UN 1953).....	102	Water-gas.
UN 1901.....	102	Calcium hydrogen sulphite.	UN 1954.....	101	Compressed gas, n.o.s.
NA 1902.....	101	Di-(2-ethylhexyl) phosphoric acid.	UN 1954.....	102	Compressed or liquefied gases.
UN 1902.....	101	Diisooctyl acid phosphate.	NA 1954.....	101	Refrigerating machine.
UN 1903.....	101	Disinfectant, liquid.	NA 1955.....	101	Chloropicrin and nonflammable, nonliquefied compressed gas mixture.
UN 1903.....	102	Disinfectants.	UN 1955.....	102	Compressed or liquefied gases.
UN 1905.....	102	Selenic acid.	NA 1955.....	101	Methyl bromide and nonflammable, nonliquefied compressed gas mixture, liquid.
UN 1905.....	101	Selenic acid, liquid.	NA 1955.....	101	Organic phosphate, Organic phos- phate compound, or Organic phosphorus compound; mixed with compressed gas.
UN 1906.....	101	Acid, sludge.	(UN 1955).....	102	Perchloryl fluoride.
UN 1906.....	102	Sludge acid.	(UN 1955).....	102	Phosphorus trifluoride.
UN 1907.....	102	Soda lime.	NA 1955.....	101	Poisonous liquid or gas, n.o.s.
UN 1907.....	101	Soda lime, solid.	(UN 1955).....	102	Tetrafluorohydrazine.
UN 1908.....	102	Sodium chlorite.	NA 1956.....	101	Accumulator, pressurized.
UN 1908.....	101	Sodium chlorite solution.	UN 1956.....	101	Compressed gas, n.o.s.
UN 1909.....	102	Sodium hydrogen sulphite.	UN 1956.....	102	Compressed or liquefied gases.
UN 1910.....	101	Calcium oxide.	NA 1956.....	101	Dichlorodifluoromethane- dichlorotetrafluoroethane mixture.
UN 1911.....	102	Diborane.	NA 1956.....	101	Dichlorodifluoromethane- monochlorodifluoromethane mix- ture.
UN 1911.....	101	Diborane or diborane mixtures.	NA 1956.....	101	Dichlorodifluoromethane- trichloromonofluoromethane mix- ture.
UN 1912.....	102	Methyl chloride and methylene chloride.	NA 1956.....	101	Dichlorodifluoromethane- trichloromonofluoromethane mix- ture.
UN 1912.....	101	Methyl chloride-methylene chloride mixture.	NA 1956.....	101	Dichlorodifluoromethane- trichloromonofluoromethane mix- ture.
UN 1913.....	102	Neon.	NA 1956.....	101	Dichlorodifluoromethane- trichlorotetrafluoroethane mixture.
UN 1914.....	102	Butyl propionate.	NA 1956.....	101	Hexafluoropropylene oxide.
UN 1915.....	102	Cyclohexanone.	NA 1956.....	101	Mine rescue equipment containing carbon dioxide.
UN 1916.....	102	Dichloroethyl ether.	UN 1956.....	101	Water pump system.
UN 1917.....	102	Ethyl acrylate.	UN 1957.....	102	Deuterium.
UN 1917.....	101	Ethyl acrylate, inhibited.	UN 1958.....	102	Dichlorotetrafluoroethane.
UN 1918.....	102	Isopropylbenzene.	UN 1959.....	102	1,1-Difluoroethylene.
UN 1919.....	102	Methyl acrylate.	UN 1960.....	101	Engine starting fluid.
UN 1919.....	101	Methyl acrylate, inhibited.	UN 1961.....	102	Ethane.
UN 1920.....	102	Nonane.	UN 1962.....	101	Ethylene.
UN 1921.....	102	Propyleneimine.	UN 1963.....	102	Helium.
UN 1921.....	101	Propyleneimine, inhibited.	UN 1964.....	102	Hydrocarbon gases.
UN 1922.....	101	Pyrolidine.	UN 1965.....	101	Hydrocarbon gas, nonliquefied.
UN 1923.....	102	Calcium dithionite.	UN 1965.....	102	Hydrocarbon gases.
UN 1924.....	102	Ethyl aluminium dichloride.	UN 1965.....	101	Hydrocarbon gas, liquefied.
UN 1925.....	102	Ethyl aluminium sesquichloride.	UN 1966.....	102	Hydrogen.
UN 1926.....	102	Methyl aluminium sesquibromide.	UN 1966.....	101	Hydrogen, liquefied.
UN 1927.....	102	Methyl aluminium sesquichloride.	UN 1967.....	102	Insecticide gases.
UN 1928.....	102	Methyl magnesium bromide.	NA 1967.....	101	Insecticide, liquefied gas, containing Poison A material or Poison B material.
UN 1928.....	101	Methyl magnesium bromide in ethyl ether.			
UN 1929.....	102	Potassium dithionite.			
UN 1930.....	102	Triisobutyl aluminium.			
UN 1931.....	102	Zinc dithionite.			
UN 1931.....	101	Zinc hydrosulfite.			
UN 1932.....	102	Zirconium.			
UN 1932.....	101	Zirconium scrap.			
UN 1935.....	102	Cyanides.			
UN 1935.....	101	Cyanide solution, n.o.s.			
UN 1938.....	102	Bromoacetic acid.			
UN 1938.....	101	Bromoacetic acid, solid.			
UN 1938.....	101	Bromoacetic acid solution.			
UN 1939.....	101	Phosphorus oxybromide.			
UN 1940.....	101	Thioglycolic acid.			
UN 1941.....	101	Dibromodifluoromethane.			
UN 1942.....	102	Ammonium nitrate.			

ILLINOIS HAZARDOUS MATERIALS TRANSPORTATION REGULATIONS

App. A

(1)— Identification Number	(2)— Source 172.***	(3)—Description	(1)— Identification Number	(2)— Source 172.***	(3)—Description
NA 1967.....	101	Parathion and compressed gas mixture.	UN 2001.....	102	Cobalt naphthenates.
UN 1968.....	102	Insecticide gases.	UN 2002.....	102	Celluloid.
NA 1968.....	101	Insecticide, liquefied gas.	UN 2003.....	102	Aluminium alkylchlorides.
UN 1969.....	102	Isobutane.	UN 2003.....	102	Aluminium alkyls.
UN 1970.....	102	Krypton.	UN 2003.....	102	Aluminium tributyl.
UN 1971.....	101	Methane.	UN 2003.....	102	Metal alkyls, n.o.s.
UN 1971.....	102	Methane or natural gases.	UN 2004.....	102	Magnesium diamide.
UN 1972.....	102	Methane or natural gases.	UN 2005.....	102	Magnesium diphenyl.
UN 1973.....	102	Chlorodifluoromethane and chloropentafluoroethane.	UN 2006.....	102	Plastics.
UN 1974.....	102	Chlorodifluorobromomethane.	NA 2006.....	101	Pyroxylin plastic scrap.
UN 1975.....	102	Nitric oxide and nitrogen tetroxide.	UN 2006.....	101	Pyroxylin plastics, rods, sheets, rolls, or tubes.
UN 1976.....	102	Octafluorocyclobutane.	UN 2008.....	102	Zirconium.
UN 1977.....	102	Nitrogen.	UN 2008.....	101	Zirconium metal, dry.
UN 1977.....	101	Nitrogen, pressurized liquid.	UN 2008.....	102	Zirconium metal powder, dry.
UN 1978.....	102	Propane.	UN 2009.....	102	Zirconium.
UN 1979.....	102	Rare gases.	UN 2010.....	102	Magnesium hydride.
NA 1980.....	101	Helium-oxygen mixture.	UN 2011.....	102	Magnesium phosphide.
UN 1980.....	102	Rare gases.	UN 2012.....	102	Potassium phosphide.
UN 1981.....	102	Rare gases.	UN 2013.....	102	Strontium phosphide.
UN 1982.....	102	Tetrafluoromethane.	UN 2014.....	102	Hydrogen peroxide.
UN 1983.....	102	Trifluorochloroethane.	UN 2014.....	101	Hydrogen peroxide solution.
UN 1984.....	102	Trifluoromethane.	UN 2015.....	102	Hydrogen peroxide.
UN 1986.....	102	Alcohols.	UN 2015.....	101	Hydrogen peroxide solution.
NA 1986.....	101	Denatured alcohol.	UN 2016.....	102	Ammunition.
NA 1986.....	101	Propargyl alcohol.	UN 2016.....	101	Chemical ammunition, nonexplosive.
NA 1986.....	101	Rum, denatured.	NA 2016.....	101	Grenade.
UN 1987.....	101	Alcohol, n.o.s.	UN 2017.....	102	Ammunition.
UN 1987.....	102	Alcohols.	UN 2017.....	101	Chemical ammunition, nonexplosive.
UN 1988.....	102	Aldehydes.	NA 2017.....	101	Grenade, tear gas.
UN 1989.....	102	Aldehydes.	UN 2018.....	102	Chloroanilines.
NA 1989.....	101	Benzaldehyde.	UN 2019.....	102	Chloroanilines.
UN 1990.....	102	Benzaldehyde.	UN 2020.....	102	Chlorophenates.
UN 1991.....	102	Chloroprene.	UN 2020.....	102	Chlorophenols.
UN 1991.....	101	Chloroprene, inhibited.	NA 2020.....	101	Pentachlorophenol.
UN 1992.....	101	Flammable liquid, poisonous, n.o.s.	NA 2020.....	101	Trichlorophenol.
UN 1992.....	102	Flammable liquids.	NA 2021.....	102	Chlorophenates.
NA 1993.....	101	Combustible liquid, n.o.s.	UN 2021.....	102	Chlorophenols.
NA 1993.....	101	Compound, cleaning, liquid.	UN 2022.....	102	Cresylic acid.
NA 1993.....	101	Compound, tree or weed killing, liquid.	NA 2022.....	101	Mining reagent, liquid.
NA 1993.....	101	Cosmetics, n.o.s.	UN 2023.....	101	Epichlorohydrin.
NA 1993.....	101	Creosote, coal tar.	UN 2024.....	102	Mercury compounds.
NA 1993.....	101	Disinfectant, liquid, n.o.s.	NA 2025.....	101	Mercury subsulfate, solid.
NA 1993.....	101	Drugs, n.o.s.	UN 2025.....	102	Mercury compounds.
NA 1993.....	101	Drugs, n.o.s.	UN 2025.....	101	Mercury compound, solid, n.o.s.
NA 1993.....	101	Ethyl nitrate.	UN 2026.....	102	Phenylmercuric compounds, n.o.s.
UN 1993.....	101	Flammable liquid, n.o.s.	UN 2027.....	102	Sodium arsenite.
UN 1993.....	102	Flammable liquids.	UN 2028.....	102	Bombs, smoke.
NA 1993.....	101	Fuel oil.	UN 2029.....	102	Hydrazine.
NA 1993.....	101	Fuel oil, No. 1, 2, 4, 5 or 6.	UN 2029.....	101	Hydrazine, anhydrous.
NA 1993.....	101	Heater for refrigerator car, liquid fuel type.	UN 2030.....	102	Hydrazine.
NA 1993.....	101	Insecticide, liquid, n.o.s.	UN 2030.....	101	Hydrazine, aqueous solution.
NA 1993.....	101	Organic peroxide, liquid or solution, n.o.s.	UN 2031.....	101	Nitric acid.
NA 1993.....	101	Plastic solvent, n.o.s.	UN 2032.....	102	Nitric acid.
NA 1993.....	101	Refrigerating machine.	UN 2032.....	101	Nitric acid, fuming.
NA 1993.....	101	Solvent, n.o.s.	UN 2033.....	102	Potassium oxide.
NA 1993.....	101	Wax, liquid.	UN 2034.....	102	Hydrogen and methane.
UN 1994.....	102	Iron carbonyl.	UN 2035.....	102	Trifluoroethane.
UN 1995.....	102	Pesticides.	UN 2036.....	101	Xenon.
UN 1996.....	102	Pesticides.	UN 2037.....	102	Cartouche.
UN 1997.....	102	Solvents.	UN 2037.....	102	Gas cartridges.
UN 1998.....	102	Solvents.	UN 2037.....	102	Receptacles.
NA 1999.....	101	Asphalt.	UN 2038.....	102	Dinitrotoluenes.
NA 1999.....	101	Asphalt, cut back.	UN 2038.....	101	Dinitrotoluene, solid.
UN 1999.....	102	Cut-backs.	UN 2044.....	102	2,2-Dimethylpropane.
UN 1999.....	101	Tar, liquid.	UN 2045.....	102	Isobutyraldehyde.
UN 2000.....	102	Celluloid.	UN 2046.....	102	p-Cymene.
			UN 2047.....	101	Dichloropropene.

ILLINOIS HAZARDOUS MATERIALS TRANSPORTATION REGULATIONS

App. A

(1)— Identification Number	(2)— Source 172.***	(3)—Description	(1)— Identification Number	(2)— Source 172.***	(3)—Description
NA 2047.....	101	Dichloropropene and propylene di- chloride mixture.	UN 2094.....	102	tert-Butyl hydroperoxide.
UN 2048.....	102	Dicyclopentadiene.	UN 2095.....	101	tert-Butyl peroxyacetate.
UN 2049.....	102	Diethylbenzene.	UN 2095.....	102	tert-Butyl peracetate.
UN 2050.....	102	Diisobutylene.	UN 2096.....	101	tert-Butyl peroxyacetate.
UN 2051.....	102	Dimethylethanolamine.	UN 2096.....	102	tert-Butyl peracetate.
UN 2052.....	102	Dipentene.	UN 2097.....	101	tert-Butyl peroxybenzoate.
UN 2053.....	102	Methyl isobutyl carbinol.	UN 2097.....	102	tert-Butyl perbenzoate.
UN 2054.....	101	Morpholine.	UN 2098.....	101	tert-Butyl peroxybenzoate.
NA 2054.....	101	Morpholine, aqueous, mixture.	UN 2098.....	102	tert-Butyl perbenzoate.
UN 2055.....	102	Styrene monomer.	UN 2099.....	101	tert-Butyl peroxybenzoate.
UN 2055.....	101	Styrene monomer, inhibited.	UN 2099.....	102	tert-Butyl permaleate.
UN 2056.....	101	Tetrahydrofuran.	UN 2100.....	101	tert-Butyl peroxybenzoate.
UN 2057.....	102	Tripropylene.	UN 2100.....	102	tert-Butyl permaleate.
UN 2058.....	102	Valeraldehyde.	UN 2101.....	101	tert-Butyl peroxybenzoate.
UN 2059.....	101	Box toe gum.	UN 2101.....	102	tert-Butyl permaleate.
NA 2059.....	101	Collodion.	UN 2102.....	101	Di-tert-butyl peroxide.
UN 2059.....	102	Nitrocellulose.	UN 2102.....	102	tert-Butyl peroxide.
NA 2059.....	101	Nitrocellulose, colloided, granular or flake, wet with not less than 20% alcohol or solvent, or block, wet with not less than 25% alcohol.	UN 2103.....	101	tert-Butyl peroxyisopropyl carbon- ate.
NA 2059.....	101	Pyroxylin solution.	UN 2103.....	102	tert-Butyl peroxy isopropyl carbon- ate.
NA 2059.....	101	Pyroxylin solvent, n.o.s.	UN 2104.....	101	tert-Butyl peroxy-3,5,5-trimethylhex- anoate or tert-Butyl peroxyison- anoate.
UN 2060.....	101	Box toe gum.	UN 2104.....	102	tert-Butyl peroxy-3,5,5-trimethyl hexanoate.
UN 2065.....	102	Endnn.	UN 2105.....	101	tert-Butyl peroxyphthalate.
UN 2067.....	101	Ammonium nitrate fertilizer.	UN 2105.....	102	tert-Butyl monoperoxyphthalate.
UN 2067.....	102	Ammonium nitrate fertilizers.	UN 2106.....	101	Di-(tert-butylperoxy)phthalate.
UN 2068.....	101	Ammonium nitrate-carbonate mix- ture.	UN 2106.....	102	tert-Butyl diperoxyphthalate.
UN 2069.....	101	Ammonium nitrate mixed fertilizer.	UN 2107.....	101	Di-(tert-butylperoxy)phthalate.
UN 2070.....	101	Ammonium nitrate-phosphate.	UN 2107.....	102	tert-Butyl diperoxyphthalate.
UN 2071.....	102	Ammonium nitrate fertilizers.	UN 2108.....	101	Di-(tert-butylperoxy)phthalate.
UN 2072.....	102	Ammonium nitrate fertilizer.	UN 2108.....	102	tert-Butyl diperoxyphthalate.
UN 2073.....	102	Ammonia.	UN 2110.....	101	tert-Butyl peroxyprovalate.
UN 2073.....	101	Ammonia solution.	UN 2110.....	102	tert-Butyl perprovalate.
UN 2074.....	102	Acrylamide.	UN 2111.....	102	2,2-Bis-(tert-butylperoxy) butane.
UN 2075.....	102	Chloral.	UN 2111.....	101	2,2-Di-(tert-butylperoxy)butane.
UN 2076.....	101	Cresol.	UN 2112.....	102	1,4-Bis-(2-tert-butylperoxy isopropyl) benzene, or 1,3-bis-(2-tert-butyl- peroxy isopropyl) benzene.
UN 2076.....	102	Cresols.	UN 2112.....	101	1,3-Di-(2-tert-butylperoxyisopropyl) benzene.
UN 2077.....	102	Naphthylamine.	UN 2112.....	101	1,3-Di-(2-tert-butylperoxyisopropyl) benzene and 1,4-Di-(2-tert- butylperoxyisopropyl) benzene mixture.
UN 2078.....	101	Toluene diisocyanate.	UN 2113.....	101	p-Chlorobenzoyl peroxide.
UN 2079.....	102	Diethylenetriamine.	UN 2113.....	102	p-Chlorobenzoyl peroxide.
UN 2080.....	101	Acetyl acetone peroxide.	UN 2114.....	101	p-Chlorobenzoyl peroxide.
UN 2081.....	101	Acetyl benzoyl peroxide.	UN 2114.....	102	p-Chlorobenzoyl peroxide.
UN 2081.....	101	Acetyl benzoyl peroxide solution.	UN 2115.....	101	p-Chlorobenzoyl peroxide.
UN 2082.....	101	Acetyl cyclohexanesulphonyl perox- ide.	UN 2115.....	102	p-Chlorobenzoyl peroxide.
UN 2082.....	102	Acetyl cyclohexane sulphonyl per- oxide.	UN 2116.....	101	Cumene hydroperoxide.
UN 2083.....	101	Acetyl cyclohexanesulphonyl perox- ide.	UN 2117.....	102	1-Hydroxy-1'-hydroperoxy dicyclo- hexyl peroxide.
UN 2083.....	102	Acetyl cyclohexane sulphonyl per- oxide.	UN 2118.....	102	1-Hydroxy-1'-hydroperoxy dicyclo- hexyl peroxide.
UN 2084.....	101	Acetyl peroxide.	UN 2118.....	101	Cyclohexanone peroxide.
UN 2084.....	101	Acetyl peroxide solution.	UN 2119.....	102	1-Hydroxy-1'-hydroperoxy dicyclo- hexyl peroxide.
NA 2085.....	101	Benzoyl peroxide.	UN 2119.....	101	Cyclohexanone peroxide.
UN 2086.....	102	Benzoyl peroxide.	UN 2120.....	101	Decanoyl peroxide.
UN 2087.....	101	Benzoyl peroxide.	NA 2121.....	101	Dicumyl peroxide.
UN 2088.....	101	Benzoyl peroxide.	UN 2121.....	101	Dicumyl peroxide, dry.
UN 2089.....	101	Benzoyl peroxide.	UN 2122.....	102	Di-(2-ethylhexyl) perdicarbonate.
UN 2090.....	101	Benzoyl peroxide.	UN 2122.....	101	Di-(2-ethylhexyl) peroxydicarbonate.
UN 2091.....	101	tert-Butyl cumyl peroxide.	UN 2123.....	102	Di-(2-ethylhexyl) perdicarbonate.
NA 2091.....	101	tert-Butyl isopropyl benzene hydro- peroxide.	UN 2123.....	101	Di-(2-ethylhexyl) peroxydicarbonate.
UN 2091.....	102	tert-Butyl cumyl peroxide.	UN 2124.....	101	Lauroyl peroxide.
UN 2092.....	101	tert-Butyl hydroperoxide.	UN 2125.....	101	p-Menthane hydroperoxide.
UN 2092.....	102	tert-Butyl hydroperoxide.			
UN 2093.....	101	tert-Butyl hydroperoxide.			
UN 2093.....	102	tert-Butyl hydroperoxide.			
UN 2094.....	101	tert-Butyl hydroperoxide.			

App. A

(1)— Identification Number	(2)— Source 172.***	(3)—Description	(1)— Identification Number	(2)— Source 172.***	(3)—Description
UN 2125.....	101	Paramenthane hydroperoxide.	UN 2154.....	101	Di-(4-tert-butylcyclohexyl)peroxydicarbonate.
UN 2125.....	102	p-Menthane hydroperoxide.	UN 2155.....	102	2,5-Dimethyl-2,5-bis-(tert-butylperoxy) hexane.
UN 2126.....	102	Isobutyl methyl ketone peroxide.	UN 2155.....	101	2,5-Dimethyl-2,5-di-(tert-butylperoxy)hexane.
UN 2126.....	101	Methyl isobutyl ketone peroxide.	UN 2156.....	102	2,5-Dimethyl-2,5-di-(tert-butylperoxy) hexane.
UN 2127.....	102	Ethyl methyl ketone peroxide(s).	UN 2156.....	101	2,5-Dimethyl-2,5-di-(tert-butylperoxy)hexane.
UN 2128.....	102	Isononanyl peroxide.	UN 2157.....	102	2,5-Dimethyl-2,5-bis-(2-ethylhexanoylperoxy) hexane.
UN 2128.....	101	Isononanyl peroxide.	UN 2157.....	101	2,5-Dimethyl-2,5-di-(2-ethylhexanoylperoxy)hexane.
NA 2129.....	101	Caprylyl peroxide solution.	UN 2158.....	102	2,5-Dimethyl-2,5-bis-(tert-butylperoxy) hexyne-3.
UN 2129.....	102	n-Octanoyl peroxide.	UN 2158.....	101	2,5-Dimethyl-2,5-di-(tert-butylperoxy)hexyne-3.
UN 2129.....	101	n-Octanoyl peroxide.	UN 2159.....	102	2,5-Dimethyl-2,5-bis-(tert-butylperoxy) hexyne-3.
UN 2130.....	102	n-Nonanoyl peroxide.	UN 2159.....	101	2,5-Dimethyl-2,5-di-(tert-butylperoxy)hexyne-3.
UN 2130.....	101	Pelargonyl peroxide.	UN 2160.....	102	1,1,3,3-Tetramethyl butyl hydroperoxide.
UN 2131.....	102	Peracetic acid.	UN 2160.....	101	1,1,3,3-Tetramethylbutyl hydroperoxide.
NA 2131.....	101	Peracetic acid solution.	UN 2161.....	102	1,1,3,3-Tetramethyl butyl peroxy-2-ethyl hexanoate.
UN 2131.....	101	Peroxyacetic acid.	UN 2161.....	101	1,1,3,3-Tetramethylbutyl peroxy-2-ethylhexanoate.
UN 2132.....	101	Propionyl peroxide.	UN 2162.....	101	Pinane hydroperoxide.
UN 2133.....	102	Diisopropyl perdicarbonate.	UN 2162.....	101	Pinane hydroperoxide solution.
NA 2133.....	101	Isopropyl percarbonate, unstabilized.	UN 2163.....	101	Diacetone alcohol peroxide.
UN 2133.....	101	Isopropyl peroxydicarbonate.	UN 2163.....	102	Diacetone alcohol peroxides.
UN 2134.....	102	Diisopropyl perdicarbonate.	UN 2164.....	102	Dicetyl perdicarbonate.
NA 2134.....	101	Isopropyl percarbonate, stabilized.	UN 2164.....	101	Dicetyl peroxydicarbonate.
UN 2134.....	101	Isopropyl peroxydicarbonate.	UN 2165.....	102	3,3,6,6,9,9-Hexamethyl-1,2,4,5-tetroxonane.
UN 2135.....	101	Succinic acid peroxide.	UN 2165.....	101	3,3,6,6,9,9-Hexamethyl-1,2,4,5-tetraoxocyclononane.
UN 2136.....	101	Tetraol hydroperoxide.	UN 2166.....	102	3,3,6,6,9,9-Hexamethyl-1,2,4,5-tetroxonane.
UN 2137.....	102	2,4-Dichlorobenzoyl peroxide.	UN 2166.....	101	3,3,6,6,9,9-Hexamethyl-1,2,4,5-tetraoxocyclononane.
UN 2137.....	101	2,4-Dichlorobenzoyl peroxide.	UN 2167.....	102	3,3,6,6,9,9-Hexamethyl-1,2,4,5-tetroxonane.
UN 2138.....	102	2,4-Dichlorobenzoyl peroxide.	UN 2167.....	101	3,3,6,6,9,9-Hexamethyl-1,2,4,5-tetraoxocyclononane.
UN 2138.....	101	2,4-Dichlorobenzoyl peroxide.	UN 2168.....	102	2,2-Bis-(4,4-di-tert-butylperoxy cyclohexyl) propane.
UN 2139.....	102	2,4-Dichlorobenzoyl peroxide.	UN 2168.....	101	2,2-Di-(4,4-di-tert-butylperoxycyclohexyl)propane.
UN 2139.....	101	2,4-Dichlorobenzoyl peroxide.	UN 2169.....	101	n-Butyl peroxydicarbonate.
UN 2140.....	101	n-Butyl-4,4-di-(tert-butylperoxy)valerate.	UN 2169.....	102	n-Butyl perdicarbonate.
UN 2140.....	102	n-Butyl-4,4-bis-(tert-butyl-peroxy) valerate.	UN 2170.....	101	n-Butyl peroxydicarbonate.
UN 2141.....	101	n-Butyl-4,4-di-(tert-butylperoxy)valerate.	UN 2170.....	102	n-Butyl perdicarbonate.
UN 2141.....	102	n-Butyl-4,4-bis-(tert-butyl-peroxy) valerate.	UN 2171.....	101	Diisopropylbenzene hydroperoxide.
UN 2142.....	101	tert-Butyl peroxyisobutyrate.	UN 2171.....	101	Diisopropylbenzene hydroperoxide solution.
UN 2142.....	102	tert-Butyl pensobutyrate.	UN 2172.....	102	2,5-Dimethyl-2,5-bis-(benzoylperoxy) hexane.
UN 2143.....	101	tert-Butyl peroxy-2-ethylhexanoate.	UN 2172.....	101	2,5-Dimethyl-2,5-di-(benzoylperoxy)hexane.
UN 2143.....	102	tert-Butyl per-(2-ethyl) hexanoate.	UN 2173.....	102	2,5-Dimethyl-2,5-bis-(benzoylperoxy) hexane.
UN 2144.....	101	tert-Butyl peroxydiethylacetate.	UN 2173.....	101	2,5-Dimethyl-2,5-di-(benzoylperoxy)hexane.
UN 2144.....	102	tert-Butyl perdiethylacetate.	UN 2174.....	102	2,5-Dimethyl-2,5-dihydroperoxy hexane.
UN 2145.....	102	1,1-Bis-(tert-butylperoxy)-3,3,5-trimethyl cyclohexane.	UN 2174.....	101	2,5-Dimethyl-2,5-dihydroperoxy hexane.
UN 2145.....	101	1,1-Di-(tert-butylperoxy)-3,3,5-trimethyl cyclohexane.			
UN 2146.....	102	1,1-Bis-(tert-butylperoxy)-3,3,5-trimethyl cyclohexane.			
UN 2146.....	101	1,1-Di-(tert-butylperoxy)-3,3,5-trimethyl cyclohexane.			
UN 2147.....	102	1,1-Bis-(tert-butylperoxy)-3,3,5-trimethyl cyclohexane.			
UN 2147.....	101	1,1-Di-(tert-butylperoxy)-3,3,5-trimethyl cyclohexane.			
UN 2148.....	102	Bis-(1-hydroxy cyclohexyl) peroxide.			
UN 2148.....	101	Di-(1-hydroxycyclohexyl) peroxide.			
UN 2149.....	102	Dibenzyl perdicarbonate.			
UN 2149.....	101	Dibenzyl peroxydicarbonate.			
UN 2150.....	102	Di-sec-butyl perdicarbonate.			
UN 2150.....	101	Di-sec-butyl peroxydicarbonate.			
UN 2151.....	102	Di-sec-butyl perdicarbonate.			
UN 2151.....	101	Di-sec-butyl peroxydicarbonate.			
UN 2152.....	102	Dicyclohexyl perdicarbonate.			
UN 2152.....	101	Dicyclohexyl peroxydicarbonate.			
UN 2153.....	102	Dicyclohexyl perdicarbonate.			
UN 2153.....	101	Dicyclohexyl peroxydicarbonate.			
UN 2154.....	102	Bis-(4-tert-butyl cyclohexyl) perdicarbonate.			

ILLINOIS HAZARDOUS MATERIALS TRANSPORTATION REGULATIONS

App. A

(1)— Identification Number	(2)— Source 172.***	(3)—Description	(1)— Identification Number	(2)— Source 172.***	(3)—Description
UN 2174.....	101	Dimethylhexane dihydroperoxide, (with 18% or more water).	UN 2221.....	102	Aluminium alkyl halides.
UN 2175.....	102	Diethyl perdicarbonate.	UN 2222.....	102	Anisole.
UN 2175.....	101	Diethyl peroxydicarbonate.	UN 2224.....	101	Benzonitrile.
UN 2176.....	101	Di-n-propyl peroxydicarbonate.	UN 2225.....	102	Benzene sulphonyl chloride.
UN 2177.....	101	tert-Butyl peroxyneodecanoate.	UN 2226.....	102	Benzotrifluoride.
UN 2177.....	102	tert-Butyl per-neodecanoate.	UN 2227.....	102	n-Butyl methacrylate.
UN 2178.....	102	2,2-Dihydroperoxy propane.	UN 2228.....	102	Butylphenols.
UN 2178.....	101	2,2-Dihydroperoxy propane.	UN 2229.....	102	Butylphenols.
UN 2179.....	102	1,1-Bis-(tert-butylperoxy) cyclohex- ane.	UN 2230.....	102	Chlorinated anthracene oil.
UN 2179.....	101	1,1-Di-(tert- butylperoxy)cyclohexane.	UN 2232.....	102	Chloroacetaldehyde.
UN 2180.....	102	1,1-Bis-(tert-butylperoxy) cyclohex- ane.	UN 2233.....	102	p-Chloro-o-anisidine.
UN 2180.....	101	1,1-Di-(tert- butylperoxy)cyclohexane.	UN 2234.....	102	Chlorobenzotrifluorides.
UN 2181.....	102	1,2-Bis-(tert-butylperoxy) cyclohex- ane.	UN 2235.....	102	p-Chlorobenzyl chloride.
UN 2181.....	101	1,2-Di-(tert- butylperoxy)cyclohexane.	UN 2236.....	102	3-Chloro-4-methylphenyl isocyan- ate.
UN 2182.....	101	Diisobutyl peroxide.	UN 2237.....	102	Chloronitroanilines.
UN 2182.....	102	Isobutyl peroxide.	UN 2238.....	102	Chlorotoluenes.
UN 2183.....	101	tert-Butyl peroxyacrylate.	UN 2239.....	102	Chlorotoluidines.
UN 2183.....	102	tert-Butyl peroxyacrylate.	UN 2240.....	102	Chromosulphuric acid.
UN 2184.....	102	Ethyl-3,3-bis-(tert-butylperoxy) butyr- ate.	UN 2241.....	102	Cycloheptane.
UN 2184.....	101	Ethyl-3,3-di-(tert- butylperoxy)butyrate.	UN 2242.....	102	Cycloheptene.
UN 2185.....	102	Ethyl-3,3-bis-(tert-butylperoxy) butyr- ate.	UN 2243.....	102	Cyclohexyl acetate.
UN 2185.....	101	Ethyl-3,3-di-(tert- butylperoxy)butyrate.	UN 2244.....	102	Cyclopentanol.
UN 2187.....	101	Carbon dioxide, liquefied.	UN 2245.....	102	Cyclopentanone.
UN 2188.....	101	Arsine.	UN 2246.....	102	Cyclopentene.
UN 2189.....	102	Dichlorosilane.	UN 2247.....	102	n-Decane.
UN 2190.....	102	Oxygen difluoride.	UN 2248.....	102	Di-(n-butyl)amine.
UN 2191.....	101	Sulfuryl fluoride.	UN 2249.....	102	sym-Dichlorodimethyl ether.
UN 2191.....	102	Sulphuryl fluoride.	UN 2250.....	102	Dichlorophenyl isocyanates.
UN 2192.....	101	Germane.	UN 2252.....	102	1,2-Dimethoxyethane.
UN 2194.....	102	Selenium hexafluoride.	UN 2253.....	102	N,N-Dimethylaniline.
UN 2195.....	102	Tellurium hexafluoride.	UN 2254.....	102	Matches.
UN 2196.....	101	Tungsten hexafluoride.	UN 2255.....	101	Organic peroxide, sample, n.o.s.
UN 2197.....	102	Hydrogen iodide.	UN 2255.....	102	Organic peroxides, n.o.s.
UN 2198.....	102	Phosphorus pentafluoride.	UN 2256.....	102	Cyclohexene.
UN 2199.....	101	Phosphine.	UN 2257.....	102	Potassium metal.
UN 2202.....	101	Hydrogen selenide.	UN 2257.....	101	Potassium, metal or metallic.
UN 2203.....	102	Silane.	UN 2258.....	102	Propylene diamine.
UN 2204.....	102	Carbonyl sulfide.	UN 2258.....	101	Propylenediamine.
UN 2205.....	102	Adiponitrile.	UN 2259.....	102	Triethylenetetramine.
UN 2206.....	102	Isocyanates.	UN 2260.....	102	Tripropylamine.
UN 2207.....	102	Isocyanates.	UN 2261.....	101	Xylenol.
UN 2208.....	101	Bleaching powder.	UN 2261.....	102	Xylenols.
UN 2208.....	102	Calcium hypochlorite mixtures.	UN 2263.....	101	1,4-Dimethylcyclohexane.
UN 2209.....	102	Formaldehyde.	UN 2263.....	102	Dimethylcyclohexanes.
UN 2209.....	101	Formaldehyde solution.	UN 2264.....	102	N, N-Dimethylcyclohexylamine.
UN 2210.....	102	Maneb, or maneb preparation(s).	UN 2265.....	102	N,N-Dimethylformamide.
NA 2210.....	101	Pesticide, water reactive.	UN 2266.....	102	Dimethyl-N-propylamine.
UN 2211.....	102	Plastics moulding materials.	UN 2267.....	102	Dimethyl thiophosphoryl chloride.
UN 2212.....	102	Asbestos, blue.	UN 2269.....	102	Dipropylene triamine.
UN 2213.....	101	Paraformaldehyde.	UN 2269.....	101	Iminobispropylamine.
UN 2214.....	102	Phthalic anhydride.	UN 2270.....	102	Ethylamine solution.
NA 2215.....	101	Maleic acid.	UN 2271.....	102	Ethyl amyl ketone.
UN 2215.....	101	Maleic anhydride.	UN 2272.....	102	N-Ethylaniline.
UN 2216.....	102	Fishmeal or fish scrap.	UN 2273.....	102	2-Ethylaniline.
NA 2216.....	101	Fish meal or fish scrap containing 6% to 12% water.	UN 2274.....	102	N-Ethyl-n-benzylaniline.
UN 2217.....	102	Seed cake.	UN 2275.....	102	2-Ethylbutanol.
UN 2218.....	101	Acrylic acid.	UN 2276.....	102	2-Ethylhexylamine.
UN 2219.....	102	Allyl glycidyl ether.	UN 2277.....	102	Ethyl methacrylate.
UN 2220.....	102	Aluminium alkyl halides, in solution.	UN 2278.....	102	n-Heptene.
			UN 2279.....	102	Hexachlorobutadiene.
			UN 2280.....	102	Hexamethylenediamine.
			UN 2280.....	101	Hexamethylenediamine, solid.
			UN 2282.....	102	Hexanols.
			UN 2283.....	102	Isobutyl methacrylate.
			UN 2284.....	102	Isobutyronitrile.
			UN 2286.....	102	Isododecane.
			UN 2287.....	102	Isheptene.
			UN 2288.....	102	Isobutene.
			UN 2289.....	102	Isophoronediamine.
			UN 2290.....	102	Isophorone diisocyanate.

App. A

(1)— Identification Number	(2)— Source 172.***	(3)—Description	(1)— Identification Number	(2)— Source 172.***	(3)—Description
NA 2291	101	Lead chloride.	UN 2351	102	Butyl nitrite.
UN 2291	102	Lead compounds.	UN 2352	102	Butyl vinyl ether.
NA 2291	101	Lead fluoborate.	UN 2353	102	Butyryl chloride.
NA 2291	101	Lead sulfate.	UN 2354	102	Chloromethyl ethyl ether.
NA 2291	101	Lead sulfide.	UN 2356	102	2-Chloropropane.
NA 2291	101	Lead thiocyanate.	UN 2357	101	Cyclohexylamine.
UN 2293	102	4-Methoxy-4-methylpentan-2-one.	UN 2358	102	Cyclooctatetraene.
UN 2294	102	N-Methylaniline.	UN 2359	102	Diallylamine.
UN 2295	102	Methyl chloroacetate.	UN 2360	102	Diallyl ether.
UN 2296	102	Methyl cyclohexane.	UN 2361	102	Diisobutylamine.
UN 2296	101	Methylcyclohexane.	UN 2362	102	1,1-Dichloroethane.
UN 2297	102	Methyl cyclohexanone.	UN 2363	101	Ethyl mercaptan.
UN 2298	101	Cyclopentane, methyl.	UN 2364	102	Propyl benzene.
UN 2298	102	Methyl cyclopentane.	UN 2366	102	Diethyl carbonate.
UN 2298	101	Methylcyclopentane.	UN 2367	102	alpha-Methyl valeraldehyde
UN 2299	101	Methyl dichloroacetate.	UN 2368	102	alpha-Pinene.
UN 2300	102	2-Methyl-5-ethylpyndine.	UN 2368	101	Pinene.
UN 2300	101	Methyl ethyl pyndine.	UN 2369	102	Ethylene glycol monobutyl ether.
UN 2301	102	2-Methylfuran.	UN 2370	102	Hex-1-ene.
UN 2301	101	Methylfuran.	UN 2371	102	Isopentenes.
UN 2302	102	5-Methylhexan-2-one.	UN 2373	102	Diethoxymethane.
UN 2303	102	Isopropenylbenzene.	UN 2375	102	Diethyl sulfide.
UN 2304	102	Napthalene, molten.	UN 2376	102	2,3-Dihydropyran.
UN 2305	102	Nitrobenzenesulphonic acid.	UN 2376	101	Dihydropyran.
UN 2306	102	Nitrobenzotrifluoride.	UN 2377	102	1,1-Dimethoxyethane.
UN 2307	102	3-Nitro-4-chlorobenzotrifluoride.	UN 2379	102	1,3-Dimethylbutylamine.
UN 2308	102	Nitrosylsulphuric acid.	UN 2380	102	Dimethyldiethoxysilane.
UN 2309	102	Octadiene.	UN 2381	102	Dimethyl disulfide.
UN 2310	102	2,4-Pentanedione.	UN 2382	102	Dimethylhydrazine.
UN 2311	102	Phenetidines.	UN 2383	102	Dipropylamine.
UN 2313	102	Picolines.	UN 2384	102	Dipropyl ether.
UN 2315	101	Polychlorinated biphenyls.	UN 2385	102	Ethylisobutyrate.
UN 2316	102	Sodium cuprocyanide.	UN 2386	102	1-Ethyl piperidine.
UN 2318	101	Sodium hydrosulfide, solid.	UN 2387	102	Fluorobenzene.
UN 2318	102	Sodium hydrosulphide.	UN 2388	102	Fluorotoluenes.
UN 2319	102	Terpene hydrocarbons n.o.s.	UN 2389	101	Furan.
UN 2320	102	Tetraethylenepentamine.	UN 2390	102	2-Iodobutane.
UN 2321	102	Trichlorobenzene.	UN 2391	102	Iodomethylpropanes.
UN 2322	102	Trichlorobutene.	UN 2392	102	Iodopropanes.
UN 2323	102	Triethyl phosphite.	UN 2393	102	Isobutyl formate.
UN 2324	102	Triisobutylene.	UN 2394	102	Isobutyl propionate.
UN 2325	102	1,3,5-Trimethylbenzene.	UN 2395	102	Isobutyl chloride.
UN 2326	102	Trimethylcyclohexylamine.	UN 2396	102	Methacraldehyde.
UN 2327	102	3,3,5-Trimethylhexamethylene diamine.	UN 2397	102	3-Methyl butan-2-one.
UN 2328	102	Trimethylhexamethylene diisocyanate.	UN 2398	102	Methyl-tert-butyl ether.
UN 2329	102	Trimethyl phosphite.	UN 2399	102	1-Methylpiperidine.
UN 2330	102	Undecane.	UN 2400	102	Methylisovalerate.
UN 2331	102	Zinc chloride.	UN 2401	102	Pipendine.
UN 2331	101	Zinc chloride, solid.	UN 2402	102	Propanethiols.
UN 2332	102	Acetaldehyde oxime.	UN 2403	102	Isopropenyl acetate.
UN 2333	102	Allyl acetate.	UN 2404	102	Propionitrile.
UN 2334	102	Allylamine.	UN 2405	102	Isopropyl butyrate.
UN 2335	102	Allyl ethyl ether.	UN 2406	102	Isopropyl isobutyrate.
UN 2336	102	Allyl formate.	UN 2407	102	Isopropyl chloroformate.
UN 2337	102	Phenyl mercaptan.	UN 2408	102	Isopropyl formate.
UN 2338	102	Benzotrifluoride.	UN 2409	102	Isopropyl propionate.
UN 2339	102	2-Bromobutane.	UN 2410	102	1,2,3,6-Tetrahydropyridine.
UN 2340	102	2-Bromoethyl ethyl ether.	UN 2411	102	Butyronitrile.
UN 2341	102	1-Bromo-3-methylbutane.	UN 2412	102	Tetrahydrothiophene.
UN 2342	102	Bromomethylpropanes.	UN 2414	102	Thiophene.
UN 2343	102	2-Bromopentane.	UN 2416	102	Trimethyl borate.
UN 2344	102	Bromopropanes.	UN 2417	102	Carbonyl fluoride.
UN 2345	102	3-Bromopropyne.	UN 2418	102	Sulphur tetrafluoride.
UN 2346	102	Butanedione.	UN 2420	102	Hexafluoroacetone.
UN 2346	101	Diacetyl.	UN 2421	102	Nitrogen trioxide.
UN 2347	102	Butane-1-thiol.	NA 2422	101	Perfluoro-2-butene.
UN 2347	101	Butyl mercaptan.	UN 2426	101	Ammonium nitrate, solution.
UN 2348	102	Butylacrylate.	UN 2427	102	Potassium chlorate.
UN 2350	102	Butyl methyl ether.	UN 2428	102	Sodium chlorate.
			UN 2429	102	Calcium chlorate.
			UN 2431	102	o-Anisidine.

ILLINOIS HAZARDOUS MATERIALS TRANSPORTATION REGULATIONS

App. A

(1)— Identification Number	(2)— Source 172.***	(3)—Description	(1)— Identification Number	(2)— Source 172.***	(3)—Description
UN 2432.....	102	N,N-Diethylaniline.	UN 2491.....	102	Ethanolamine.
UN 2433.....	102	Chloro-o-nitrotoluene.	UN 2491.....	101	Monoethanolamine.
UN 2434.....	102	Dibenzylchlorosilane.	UN 2493.....	101	Hexamethylenimine.
UN 2435.....	101	Ethyl phenyl dichlorosilane.	UN 2495.....	101	Iodine pentafluoride.
UN 2435.....	102	Ethylphenyldichlorosilane.	UN 2496.....	101	Propionic anhydride.
UN 2436.....	102	Thioacetic acid.	UN 2497.....	102	Sodium phenolate.
UN 2437.....	102	Methylphenyldichlorosilane.	UN 2497.....	101	Sodium phenolate, solid.
UN 2438.....	102	Pivaloyl chloride.	UN 2498.....	102	1,2,3,6-Tetrahydrobenzaldehyde.
UN 2438.....	101	Trimethylacetyl chloride.	UN 2498.....	101	1,2,3,6-Tetrahydrobenzaldehyde.
UN 2439.....	101	Sodium bifluoride, solid.	UN 2501.....	102	Tris-(1-aziridinyl)phosphine oxide.
UN 2439.....	101	Sodium bifluoride, solution.	UN 2501.....	101	Tris-(1-aziridinyl) phosphine oxide.
UN 2439.....	102	Sodium hydrogen fluoride.	UN 2502.....	101	Valeryl chloride.
UN 2440.....	102	Stannic chloride pentahydrate.	UN 2502.....	102	Valeryl chlorides.
UN 2441.....	102	Titanium trichloride.	UN 2503.....	102	Zirconium tetrachloride.
UN 2442.....	102	Trichloroacetyl chloride.	UN 2503.....	101	Zirconium tetrachloride, solid.
UN 2443.....	102	Vanadium oxytrichloride.	UN 2504.....	101	Acetylene tetrabromide.
UN 2443.....	101	Vanadium oxytrichloride.	UN 2505.....	101	Ammonium fluoride.
NA 2443.....	101	Vanadium oxytrichloride and titanium tetrachloride mixture.	UN 2506.....	101	Ammonium hydrogen sulfate.
UN 2444.....	101	Vanadium tetrachloride.	UN 2507.....	102	Chloroplatinic acid.
UN 2445.....	102	Lithium alkyls.	UN 2507.....	101	Chloroplatinic acid, solid.
UN 2446.....	102	Nitrocresols.	UN 2508.....	101	Molybdenum pentachloride.
UN 2447.....	102	Phosphorus white, molten.	UN 2509.....	101	Potassium hydrogen sulfate, solid.
UN 2448.....	102	Sulphur, molten.	UN 2511.....	102	Chloropropionic acid.
NA 2449.....	101	Ammonium oxalate.	UN 2512.....	102	Aminophenols.
NA 2449.....	101	Cupric oxalate.	UN 2513.....	102	Bromoacetyl bromide.
UN 2449.....	102	Oxalates.	UN 2514.....	101	Bromobenzene.
UN 2451.....	101	Nitrogen trifluoride.	UN 2515.....	102	Bromoforn.
UN 2456.....	102	2-Chloropropene.	UN 2516.....	102	Carbon tetrabromide.
UN 2456.....	101	2-Chloropropene.	UN 2517.....	101	Diffuoromonochloroethane.
UN 2457.....	101	2,3-Dimethylbutane.	UN 2518.....	102	1,5,9-Cyclododecatene.
UN 2458.....	101	Hexadiene.	UN 2520.....	102	Cyclooctadienes.
UN 2459.....	102	2-Methyl-1-butene.	UN 2521.....	102	Diketene.
UN 2460.....	102	2-Methyl-2-butene.	UN 2522.....	102	Dimethylaminoethyl methacrylate.
UN 2460.....	101	Methyl butene.	UN 2524.....	102	Ethyl orthoformate.
UN 2461.....	101	Methylpentadiene.	UN 2525.....	102	Ethyl oxalate.
UN 2462.....	101	Methyl pentane.	UN 2526.....	102	Furfurylamine.
UN 2462.....	102	Methylpentanes.	UN 2527.....	102	Isobutyl acrylate.
UN 2463.....	102	Aluminum hydride.	UN 2528.....	102	Isobutylisobutyrate.
UN 2463.....	101	Aluminum hydride.	UN 2529.....	101	Isobutyric acid.
UN 2464.....	101	Beryllium nitrate.	UN 2530.....	101	Isobutyric anhydride.
UN 2465.....	102	Dichloroisocyanuric acid.	UN 2531.....	102	Methacrylic acid.
NA 2465.....	101	Potassium dichloro-s-triazinetriene.	UN 2533.....	102	Methyl trichloroacetate.
UN 2465.....	101	Sodium dichloro-s-triazinetriene.	UN 2534.....	102	Methyl chlorosilane.
UN 2466.....	102	Potassium superoxide.	UN 2535.....	102	Methylmorpholine.
UN 2467.....	102	Sodium percarbonates.	UN 2536.....	102	Methyltetrahydrofuran.
UN 2468.....	102	Trichloroisocyanuric acid.	UN 2538.....	102	Nitronaphthalene.
UN 2468.....	101	Trichloro-s-triazinetriene.	UN 2541.....	102	Terpinolene.
NA 2468.....	101	(mono-(Trichloro) tetra-(monopotassium dichloro)-penta-s-triazinetriene, dry.	UN 2542.....	102	Tributylamine.
UN 2469.....	102	Zinc bromate.	UN 2545.....	101	Hafnium metal, dry.
UN 2470.....	102	Benzyl cyanide.	UN 2545.....	102	Hafnium metal powder, dry.
UN 2471.....	102	Osmium tetroxide.	UN 2546.....	102	Titanium metal powder, dry.
UN 2473.....	102	Sodium arsaniolate.	UN 2546.....	101	Titanium metal powder, dry or wet.
UN 2474.....	101	Thiophosgene.	UN 2547.....	102	Sodium superoxide.
UN 2475.....	102	Vanadium trichloride.	UN 2550.....	102	Ethyl methyl ketone peroxide(s).
UN 2477.....	102	Methyl isothiocyanate.	UN 2550.....	101	Methyl ethyl ketone peroxide.
UN 2478.....	102	Isocyanates.	UN 2551.....	101	tert-Butyl peroxydiethylacetate, with tert-Butyl peroxybenzoate.
UN 2480.....	102	Methyl isocyanate.	UN 2551.....	102	tert-Butyl perdiethylacetate.
UN 2481.....	102	Ethyl isocyanate.	UN 2552.....	102	Hexafluoroacetone hydrate.
UN 2482.....	102	n-Propyl isocyanate.	UN 2553.....	102	Coal tar naphtha.
UN 2483.....	102	Isopropyl isocyanate.	NA 2553.....	101	Coal tar naphtha.
UN 2484.....	102	tert-Butyl isocyanate.	UN 2553.....	101	Naphtha.
UN 2485.....	101	n-Butyl isocyanate.	UN 2554.....	102	Methyl allyl chloride.
UN 2485.....	102	n-Butyl isocyanate.	UN 2555.....	102	Nitrocellulose.
UN 2486.....	102	Isobutyl isocyanate.	NA 2555.....	101	Nitrocellulose, colloided, granular or flake, wet with not less than 20% water.
UN 2487.....	102	Phenyl isocyanate.			
UN 2488.....	102	Cyclohexyl isocyanate.	NA 2555.....	101	Nitrocellulose, wet with not less than 20% water.
UN 2489.....	102	Diphenylmethane diisocyanate.			
UN 2490.....	101	Dichloroisopropyl ether.	UN 2556.....	102	Nitrocellulose.

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(1)— Identification Number	(2)— Source 172.***	(3)—Description	(1)— Identification Number	(2)— Source 172.***	(3)—Description
NA 2556.....	101	Nitrocellulose, wet with not less than 30% alcohol or solvent.	NA 2672.....	101	Ammonium hydroxide.
NA 2557.....	101	Lacquer base, or Lacquer chips, dry.	UN 2674.....	102	Sodium silicofluoride.
UN 2557.....	102	Nitrocellulose.	NA 2683.....	101	Ammonium hydrosulfide solution.
UN 2558.....	102	1-Bromo-2,3-epoxypropane.	UN 2683.....	101	Ammonium sulfide solution.
UN 2562.....	101	tert-Butyl peroxyisobutyrate.	UN 2686.....	102	Diethylaminoethanol.
UN 2562.....	102	tert-Butyl perisobutyrate.	UN 2692.....	101	Boron tribromide.
UN 2564.....	102	Trichloroacetic acid.	NA 2693.....	101	Ammonium bisulfite, solid.
UN 2564.....	101	Trichloroacetic acid solution.	NA 2693.....	101	Ammonium bisulfite solution.
UN 2565.....	102	Dicyclohexylamine.	NA 2693.....	101	Calcium hydrogen sulfite solution.
UN 2567.....	101	Sodium pentachlorophenate.	NA 2693.....	101	Potassium metabisulfite.
NA 2570.....	101	Cadmium acetate.	NA 2693.....	101	Sodium hydrogen sulfite, solid.
NA 2570.....	101	Cadmium bromide.	NA 2693.....	101	Sodium hydrogen sulfite, solution.
NA 2570.....	101	Cadmium chloride.	NA 2693.....	101	Sodium metabisulfite.
UN 2570.....	102	Cadmium compounds.	UN 2703.....	101	Isopropyl mercaptan.
UN 2572.....	102	Phenylhydrazine.	UN 2704.....	101	Propyl mercaptan.
UN 2573.....	102	Thallium chlorate.	UN 2706.....	102	Diethylcarbinol.
UN 2574.....	102	Tricresylphosphate.	UN 2707.....	102	Dimethyldioxanes.
UN 2582.....	101	Ferric chloride solution.	UN 2708.....	102	Butoxyl.
UN 2584.....	101	Alkanesulfonic acid.	UN 2709.....	102	Butyl benzenes.
NA 2584.....	101	Dodecylbenzenesulfonic acid.	UN 2710.....	102	Butyrene.
UN 2584.....	101	Toluene sulfonic acid, liquid.	UN 2711.....	102	Dibromobenzene.
NA 2588.....	101	Insecticide, dry, n.o.s.	UN 2725.....	101	Nickel nitrate.
UN 2588.....	102	Pesticides.	UN 2728.....	101	Zirconium nitrate.
UN 2590.....	102	Asbestos, white.	UN 2733.....	102	Alkylamines and polyamines.
UN 2592.....	101	Distearyl peroxydicarbonate.	UN 2740.....	102	n-Propyl chloroformate.
UN 2592.....	102	Distearyl peroxydicarbonate.	UN 2749.....	102	Tetramethylsilane.
UN 2593.....	102	Bis-(2-methylbenzoyl)peroxide.	UN 2752.....	102	1,2-Epoxy-3-ethoxy propane.
UN 2593.....	101	Di-(2-methylbenzoyl)peroxide.	UN 2755.....	101	3-Chloroperoxybenzoic acid.
UN 2594.....	101	tert-Butyl peroxyneodecanoate.	UN 2755.....	102	m-Chloroperoxybenzoic acid.
UN 2594.....	102	tert-Butylperneodecanoate.	UN 2756.....	101	Organic peroxide, mixture.
UN 2595.....	101	Dimyristyl peroxydicarbonate.	UN 2756.....	102	Organic peroxides, mixture.
UN 2595.....	102	Dimyristyl peroxydicarbonate.	UN 2757.....	101	Carbamate pesticide, liquid, n.o.s.
UN 2596.....	102	3-tert-Butylperoxy-3-phenyl phthalide.	UN 2757.....	101	Carbamate pesticide, solid, n.o.s.
UN 2596.....	101	3-tert-Butyl peroxy-3-phenylphthalide.	NA 2757.....	101	Carbaryl.
UN 2597.....	102	Bis-(3,5,5-trimethyl-1,2-dioxolanyl-3)peroxide.	NA 2757.....	101	Carbaryl.
UN 2597.....	101	Di-(3,5,5-trimethyl-1,2-dioxolanyl-3)peroxide.	NA 2757.....	101	Carbaryl.
UN 2598.....	102	Ethyl-3,3-bis(tert-butylperoxy)butyrate.	UN 2758.....	101	Carbaryl.
UN 2598.....	101	Ethyl-3,3-di(tert-butylperoxy)butyrate.	UN 2759.....	101	Carbaryl.
UN 2602.....	101	Dichlorodifluoromethane and difluoroethane mixture.	UN 2759.....	101	Carbaryl.
UN 2603.....	102	Cycloheptatriene.	UN 2759.....	101	Carbaryl.
UN 2604.....	102	Boron trifluoride diethyl etherate.	NA 2759.....	101	Carbaryl.
UN 2605.....	102	Methoxymethyl isocyanate.	NA 2759.....	101	Carbaryl.
UN 2606.....	102	Methyl orthosilicate.	UN 2760.....	101	Carbaryl.
UN 2607.....	102	Acrolein dimer.	NA 2761.....	101	Carbaryl.
UN 2608.....	102	Nitropropanes.	NA 2761.....	101	Carbaryl.
UN 2610.....	102	Triallylamine.	NA 2761.....	101	Carbaryl.
UN 2612.....	102	Methyl propyl ether.	NA 2761.....	101	Carbaryl.
UN 2614.....	102	Methyl alcohol.	NA 2761.....	101	Carbaryl.
UN 2615.....	102	Ethyl propyl ether.	NA 2761.....	101	Carbaryl.
UN 2616.....	102	Triisopropyl borate.	NA 2761.....	101	Carbaryl.
UN 2617.....	102	Methyl cyclohexanol.	NA 2761.....	101	Carbaryl.
UN 2618.....	102	Vinyl Toluene.	NA 2761.....	101	Carbaryl.
UN 2619.....	102	Benzyl dimethylamine.	NA 2761.....	101	Carbaryl.
UN 2621.....	102	Acetyl methyl carbinol.	UN 2761.....	101	Carbaryl.
UN 2622.....	102	Glycidaldehyde.	UN 2761.....	101	Carbaryl.
NA 2626.....	101	Chloric acid.	UN 2761.....	101	Carbaryl.
UN 2630.....	101	Sodium selenite.	UN 2761.....	101	Carbaryl.
UN 2646.....	101	Hexachlorocyclopentadiene.	UN 2761.....	101	Carbaryl.
UN 2655.....	102	Potassium silicofluoride.	UN 2761.....	101	Carbaryl.
UN 2656.....	101	Quinoline.	UN 2761.....	101	Carbaryl.
UN 2670.....	102	Cyanuric chloride.	UN 2761.....	101	Carbaryl.
UN 2672.....	102	Ammonia solutions.	UN 2761.....	101	Carbaryl.

App. A

(1)— Identification Number	(2)— Source 172.***	(3)—Description	(1)— Identification Number	(2)— Source 172.***	(3)—Description
NA 2762.....	101	Chlordane, liquid.	NA 2783.....	101	Coumaphos mixture, liquid.
UN 2762.....	101	Organochlorine pesticide, liquid, n.o.s.	NA 2783.....	101	Diazinon.
UN 2763.....	101	Triazine pesticide, liquid, n.o.s.	NA 2783.....	101	Dichlorvos.
UN 2763.....	101	Triazine pesticide, solid, n.o.s.	NA 2783.....	101	Dichlorvos mixture, dry.
UN 2764.....	101	Triazine pesticide, liquid, n.o.s.	NA 2783.....	101	Disulfoton.
NA 2765.....	101	2,4-Dichlorophenoxyacetic acid.	NA 2783.....	101	Disulfoton mixture, dry.
NA 2765.....	101	2,4-Dichlorophenoxyacetic acid ester.	NA 2783.....	101	Disulfoton mixture, liquid.
UN 2765.....	101	Phenoxy pesticide, liquid, n.o.s.	NA 2783.....	101	Ethion.
UN 2765.....	101	Phenoxy pesticide, solid, n.o.s.	NA 2783.....	101	Ethion mixture, dry.
NA 2765.....	101	Propargite.	NA 2783.....	101	Hexaethyl tetraphosphate mixture, dry.
NA 2765.....	101	2,4,5-Trichlorophenoxyacetic acid.	NA 2783.....	101	Hexaethyl tetraphosphate mixture, liquid.
NA 2765.....	101	2,4,5-Trichlorophenoxyacetic acid amine, ester, or salt.	NA 2783.....	101	Malathion.
NA 2765.....	101	2,4,5-Trichlorophenoxypropionic acid.	NA 2783.....	101	Methyl parathion, liquid.
NA 2765.....	101	2,4,5-Trichlorophenoxypropionic acid ester.	NA 2783.....	101	Methyl parathion mixture, dry.
UN 2766.....	101	Phenoxy pesticide, liquid, n.o.s.	NA 2783.....	101	Methyl parathion mixture, liquid.
NA 2767.....	101	Diuron.	NA 2783.....	101	Methyl parathion mixture, liquid, (containing 25% or less methyl parathion).
UN 2767.....	101	Phenylurea pesticide, liquid, n.o.s.	NA 2783.....	101	Mevinphos.
UN 2767.....	101	Phenylurea pesticide, solid, n.o.s.	NA 2783.....	101	Mevinphos mixture, dry.
UN 2768.....	101	Phenylurea pesticide, liquid, n.o.s.	UN 2783.....	101	Mevinphos mixture, liquid.
UN 2769.....	101	Benzoic derivative pesticide, liquid, n.o.s.	NA 2783.....	101	Mipatfox.
UN 2769.....	101	Benzoic derivative pesticide, solid, n.o.s.	NA 2783.....	101	Naled.
NA 2769.....	101	Dicamba.	NA 2783.....	101	Organic phosphate mixture, Organ- ic phosphate compound mixture, or Organic phosphorus com- pound mixture; liquid.
NA 2769.....	101	Dichlobenil.	NA 2783.....	101	Organic phosphate mixture, Organ- ic phosphate compound mixture, or Organic phosphorus com- pound mixture; solid or dry.
UN 2770.....	101	Benzoic derivative pesticide, liquid, n.o.s.	NA 2783.....	101	Organic phosphate, Organic phos- phate compound, or Organic phosphorus compound; liquid.
UN 2771.....	101	Dithiocarbamate pesticide, liquid, n.o.s.	NA 2783.....	101	Organic phosphate, Organic phos- phate compound, or Organic phosphorus compound; solid or dry.
UN 2771.....	101	Dithiocarbamate pesticide, solid, n.o.s.	NA 2783.....	101	Organophosphorus pesticide, liquid, n.o.s.
NA 2771.....	101	Thiram.	UN 2783.....	101	Organophosphorus pesticide, solid, n.o.s.
UN 2772.....	101	Dithiocarbamate pesticide, liquid, n.o.s.	NA 2783.....	101	Parathion, liquid.
UN 2773.....	101	Phthalimide derivative pesticide, liquid, n.o.s.	NA 2783.....	101	Parathion mixture, dry.
UN 2773.....	101	Phthalimide derivative pesticide, solid, n.o.s.	NA 2783.....	101	Parathion mixture, liquid.
UN 2774.....	101	Phthalimide derivative pesticide, liquid, n.o.s.	NA 2783.....	101	Phencapton.
UN 2775.....	101	Copper based pesticide, liquid, n.o.s.	NA 2783.....	101	Tetraethyl pyrophosphate, liquid.
UN 2775.....	101	Copper based pesticide, solid, n.o.s.	NA 2783.....	101	Tetraethyl pyrophosphate mixture, dry.
UN 2776.....	101	Copper based pesticide, liquid, n.o.s.	NA 2783.....	101	Tetraethyl pyrophosphate mixture, liquid.
UN 2777.....	101	Mercury based pesticide, liquid, n.o.s.	NA 2783.....	101	Trichlorfon.
UN 2777.....	101	Mercury based pesticide, solid, n.o.s.	UN 2784.....	101	Organophosphorus pesticide, liquid, n.o.s.
UN 2778.....	101	Mercury based pesticide, liquid, n.o.s.	UN 2785.....	102	4-Thiopental.
UN 2779.....	101	Substituted nitrophenol pesticide, liquid, n.o.s.	UN 2786.....	101	Organotin pesticide, liquid, n.o.s.
UN 2779.....	101	Substituted nitrophenol pesticide, solid, n.o.s.	UN 2786.....	101	Organotin pesticide, solid, n.o.s.
UN 2780.....	101	Substituted nitrophenol pesticide, liquid, n.o.s.	UN 2787.....	101	Organotin pesticide, liquid, n.o.s.
UN 2781.....	101	Bipyridilium pesticide, liquid, n.o.s.	UN 2789.....	101	Acetic acid, glacial.
UN 2781.....	101	Bipyridilium pesticide, solid, n.o.s.	UN 2790.....	101	Acetic acid.
NA 2781.....	101	Diquat.	NA 2791.....	101	Aircraft rocket engine.
NA 2782.....	101	Bipyridilium pesticide, liquid, n.o.s.	UN 2792.....	101	Aircraft rocket engine igniter.
NA 2783.....	101	Azinphos methyl.	UN 2793.....	102	Iron swarf.
NA 2783.....	101	Azinphos methyl mixture, liquid.	UN 2793.....	101	Metal borings, shavings, turnings, or cuttings.
NA 2783.....	101	Chlorpyrifos.	NA 2794.....	101	Battery charger with electrolyte (acid) or alkaline battery fluid.
NA 2783.....	101	Coumaphos.	NA 2794.....	101	Battery, electric storage, wet.

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App. A

(1)— Identification Number	(2)— Source 172.***	(3)—Description	(1)— Identification Number	(2)— Source 172.***	(3)—Description
NA 2794.....	101	Battery, electric storage, wet, with automobile, auto parts, engine.	UN 2854.....	101	Ammonium silicofluoride.
NA 2794.....	101	Battery, electric storage, wet, with containers of electrolyte (acid) or alkaline battery fluid.	UN 2855.....	101	Zinc silicofluoride.
UN 2796.....	101	Electrolyte (acid) battery fluid.	UN 2857.....	101	Refrigerating machine.
UN 2797.....	101	Alkaline battery fluid.	UN 2859.....	102	Ammonium metavanadate.
NA 2797.....	101	Alkaline battery fluid with empty storage battery.	UN 2860.....	102	Vanadium trioxide.
NA 2797.....	101	Electrolyte (acid) or alkaline battery fluid, packed with battery charger, radio current supply device, or electronic equipment and actuating device.	UN 2861.....	102	Ammonium polyvanadate.
NA 2797.....	101	Electrolyte (acid) or alkaline battery fluid, packed with dry-storage battery.	UN 2862.....	101	Vanadium pentoxide.
UN 2798.....	101	Benzene phosphorus dichloride.	UN 2863.....	102	Sodium-ammonium-vanadate.
UN 2799.....	101	Benzene phosphorus trichloride.	UN 2864.....	102	Potassium metavanadate.
NA 2801.....	101	Coal tar dye, liquid.	UN 2867.....	101	Ink.
UN 2801.....	101	Dye intermediate, liquid.	UN 2868.....	101	Resin solution.
UN 2802.....	101	Copper chloride.	UN 2876.....	101	Resorcinol.
UN 2803.....	101	Gallium metal, liquid.	UN 2880.....	101	Calcium hypochlorite, hydrated.
UN 2803.....	101	Gallium metal, solid.	UN 2883.....	101	2,2-Di-(tert-butylperoxy)propane.
UN 2805.....	101	Lithium hydride in fused solid form.	UN 2884.....	101	2,2-Di-(tert-butylperoxy)propane.
UN 2806.....	101	Lithium nitride.	UN 2885.....	101	1,1-Di-(tert-butylperoxy)cyclohexane.
UN 2807.....	101	Magnetized material.	UN 2886.....	101	tert-Butyl peroxy-2-ethylhexanoate, with 2,2-Di-(tert-butylperoxy)butane.
NA 2809.....	101	Mercury, metallic.	UN 2887.....	101	tert-Butyl peroxy-2-ethylhexanoate, with 2,2-Di-(tert-butylperoxy)butane.
NA 2810.....	101	Arsenious and mercuric iodide solution.	UN 2888.....	101	tert-Butyl peroxy-2-ethylhexanoate.
NA 2810.....	101	Compound, tree or weed killing, liquid.	UN 2889.....	101	Diisotridecyl peroxydicarbonate.
NA 2810.....	101	Drugs, n.o.s. liquid.	UN 2890.....	101	tert-Butyl peroxybenzoate.
UN 2810.....	101	Poisonous liquid, n.o.s. or Poison B, liquid, n.o.s.	UN 2891.....	101	tert- Amyl peroxyneodecanoate.
UN 2810.....	102	Poisonous liquids, n.o.s.	UN 2892.....	101	Dimynstyl peroxydicarbonate.
UN 2811.....	101	Drugs, n.o.s. solid.	UN 2893.....	101	Lauroyl peroxide.
NA 2811.....	101	Flue dust, poisonous.	UN 2894.....	101	Di-(4-tert-butylcyclohexyl)peroxydicarbonate.
NA 2811.....	101	Lead fluoride.	UN 2895.....	101	Dicetyl peroxydicarbonate.
NA 2811.....	101	Lead iodide.	UN 2896.....	101	Cyclohexanone peroxide.
NA 2811.....	101	Lead stearate.	UN 2897.....	101	1,1-Di-(tert-butylperoxy)cyclohexane.
UN 2811.....	101	Poisonous solid, n.o.s. or Poison B, solid, n.o.s.	UN 2898.....	101	tert-Amyl peroxy-2-ethylhexanoate.
UN 2811.....	102	Poisonous solids, n.o.s.	UN 2899.....	101	Organic peroxide, trial quantity, n.o.s.
NA 2811.....	101	Selenium oxide.	NA 2902.....	101	Allethrin.
(UN 2811)	102	Silicofluorides.	NA 2902.....	101	Insecticide, liquid, n.o.s.
UN 2812.....	101	Sodium aluminate, solid.	UN 2910.....	101	Radioactive material, limited quantity, n.o.s.
NA 2813.....	101	Lithium acetylide-ethylene diamine complex.	UN 2911.....	101	Radioactive device, n.o.s.
UN 2813.....	101	Water reactive solid, n.o.s.	UN 2912.....	101	Radioactive material, low specific activity or LSA, n.o.s.
NA 2814.....	101	Etiologic agent, n.o.s.	UN 2918.....	101	Radioactive material, fissile, n.o.s.
UN 2814.....	101	Infectious substance, human, n.o.s.	UN 2922.....	101	Corrosive liquid, poisonous, n.o.s.
UN 2815.....	101	N-Aminoethylpiperazine.	NA 2922.....	101	Dimethyl chlorothiophosphate.
UN 2817.....	101	Ammonium hydrogen fluoride solution.	NA 2922.....	101	Sodium hydrosulfide, solution.
UN 2818.....	101	Ammonium polysulfide solution.	NA 2923.....	101	Sodium hydrosulfide, solid.
UN 2819.....	101	Amyl acid phosphate.	NA 2924.....	101	Dichlorobutene.
UN 2820.....	101	Butyric acid.	UN 2924.....	101	Flammable liquid, corrosive, n.o.s.
NA 2821.....	101	Phenol, liquid or solution.	UN 2925.....	101	Flammable solid, corrosive, n.o.s.
UN 2823.....	101	Crotonic acid.	UN 2926.....	101	Flammable solid, poisonous, n.o.s.
UN 2826.....	101	Ethyl chloroformate.	UN 2928.....	101	Poisonous solid, corrosive, n.o.s.
UN 2830.....	101	Lithium ferrosilicon.	NA 9011.....	101	Camphene.
UN 2831.....	101	1,1,1-Trichloroethane.	NA 9018.....	101	Dichlorodifluoroethylene.
UN 2835.....	101	Sodium aluminum hydride.	NA 9026.....	101	Dinitrocyclohexylphenol.
UN 2837.....	101	Sodium hydrogen sulfate solution.	NA 9035.....	101	Gas identification set.
NA 2845.....	101	Ethyl phosphonous dichloride, anhydrous.	NA 9037.....	101	Hexachloroethane.
NA 2845.....	101	Methyl phosphonous dichloride.	NA 9053.....	101	Oiled material.
UN 2845.....	101	Pyrophoric liquid, n.o.s. or Pyrolonic liquid, n.o.s.	NA 9069.....	101	Tetramethylmethylenediamine.
			NA 9077.....	101	Adipic acid.
			NA 9078.....	101	Aluminum sulfate, solid.
			NA 9079.....	101	Ammonium acetate.
			NA 9080.....	101	Ammonium benzoate.
			NA 9081.....	101	Ammonium bicarbonate.
			NA 9083.....	101	Ammonium carbamate.
			NA 9084.....	101	Ammonium carbonate.
			NA 9085.....	101	Ammonium chloride.
			NA 9086.....	101	Ammonium chromate.

ILLINOIS HAZARDOUS MATERIALS TRANSPORTATION REGULATIONS

App. A

(1)— Identification Number	(2)— Source 172.***	(3)—Description	(1)— Identification Number	(2)— Source 172.***	(3)—Description
NA 9087	101	Ammonium citrate, dibasic.	NA 9151	101	Triethanolamine
NA 9088	101	Ammonium fluoborate.			dodecylbenzenesulfonate.
NA 9089	101	Ammonium sulfamate.	NA 9152	101	Vanadyl sulfate.
NA 9090	101	Ammonium sulfite.	NA 9153	101	Zinc acetate.
NA 9091	101	Ammonium tartrate.	NA 9154	101	Zinc ammonium chloride.
NA 9092	101	Ammonium thiocyanate.	NA 9155	101	Zinc borate.
NA 9093	101	Ammonium thiosulfate.	NA 9156	101	Zinc bromide.
NA 9094	101	Benzoic acid.	NA 9157	101	Zinc carbonate.
NA 9095	101	n-Butyl phthalate.	NA 9158	101	Zinc fluoride.
NA 9096	101	Calcium chromate.	NA 9159	101	Zinc formate.
NA 9097	101	Calcium dodecylbenzenesulfonate.	NA 9160	101	Zinc phenolsulfonate.
NA 9099	101	Captan.	NA 9161	101	Zinc sulfate.
NA 9100	101	Chromic sulfate.	NA 9162	101	Zirconium potassium fluoride.
NA 9101	101	Chromic acetate.	NA 9163	101	Zirconium sulfate.
NA 9102	101	Chromous chloride.	NA 9170	101	Thorium metal, pyrophoric.
NA 9103	101	Cobaltous bromide.	NA 9171	101	Thorium nitrate.
NA 9104	101	Cobaltous formate.	NA 9173	101	Uranium hexafluoride, fissile.
NA 9105	101	Cobaltous sulfamate.	NA 9174	101	Uranium hexafluoride, low specific activity.
NA 9106	101	Cupric acetate.	NA 9175	101	Uranium metal, pyrophoric.
NA 9109	101	Cupric sulfate.	NA 9177	101	Uranyl nitrate, solid.
NA 9110	101	Cupric sulfate, ammoniated.	NA 9178	101	Uranyl nitrate hexahydrate solution.
NA 9111	101	Cupric tartrate.	NA 9180	101	Uranyl acetate.
NA 9117	101	Ethylenediaminetetraacetic acid.	NA 9181	101	Radioactive material, n.o.s.
NA 9118	101	Ferric ammonium citrate.	NA 9182	101	Radioactive material, special form, n.o.s.
NA 9119	101	Ferric ammonium oxalate.			
NA 9120	101	Ferric fluoride.	NA 9183	101	Organic peroxide, liquid or solution, n.o.s.
NA 9121	101	Ferric sulfate.			
NA 9122	101	Ferrous ammonium sulfate.	NA 9184	101	Pyrethrins.
NA 9125	101	Ferrous sulfate.	NA 9185	101	Plutonium nitrate, solution.
NA 9126	101	Fumaric acid.	NA 9187	101	Organic peroxide, solid, n.o.s.
NA 9127	101	Isopropanolamine	NA 9188	101	Hazardous substance, liquid or solid, n.o.s.
		dodecylbenzenesulfonate.			
NA 9134	101	Lithium chromate.	NA 9189	101	Hazardous waste, liquid or solid, n.o.s.
NA 9137	101	Naphthenic acid.			
NA 9138	101	Nickel ammonium sulfate.	NA 9190	101	Ammonium permanganate.
NA 9139	101	Nickel chloride.	NA 9191	101	Chlorine dioxide hydrate, frozen.
NA 9140	101	Nickel hydroxide.	NA 9193	101	Oxidizer, corrosive, liquid, n.o.s.
NA 9141	101	Nickel sulfate.	NA 9194	101	Oxidizer, corrosive, solid, n.o.s.
NA 9142	101	Potassium chromate.	NA 9195	101	Metal alkyl, solution, n.o.s.
NA 9145	101	Sodium chromate.	NA 9199	101	Oxidizer, poisonous, liquid, n.o.s.
NA 9146	101	Sodium dodecylbenzenesulfonate.	NA 9200	101	Oxidizer, poisonous, solid, n.o.s.
NA 9147	101	Sodium phosphate, dibasic.	NA 9201	101	Antimony trioxide.
NA 9148	101	Sodium phosphate, tribasic.			
NA 9149	101	Strontium chromate.			

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SUBPART C-SHIPPING PAPERS

§ 172.200 APPLICABILITY.

(a) Description of hazardous materials required. Except as otherwise provided in this subpart, each person who offers a hazardous material for transportation by highway in Illinois shall describe the hazardous material on a shipping paper in the manner required by this subpart.

(b) Other than a material that is a hazardous waste or a hazardous substance, this subpart does not apply to limited quantities or to any material that is an ORM-A, B, C, or D.

(c) The requirement of § 172.202(a)(3) pertaining to the display of identification numbers on shipping papers does not apply prior to January 1, 1983.

(Source: 7 Ill. Reg 3486, effective April 2, 1983)

§ 172.201 GENERAL ENTRIES.

(a) Contents. When a description of hazardous material is required to be included on a shipping paper, that description must conform to the following requirements:

(1) When a hazardous material and a material not subject to the requirements of this subchapter are described on the same shipping paper, the hazardous material description entries required by § 172.202 and those additional entries that may be required by § 172.203:

(i) Must be entered first, or

(ii) Must be entered in a color that clearly contrasts with any description of a material not subject to the requirements of this subchapter on the shipping paper except that a description on a reproduction of a shipping paper may be highlighted, rather than printed, in a contrasting color (the provisions of this paragraph apply only to the basic description required by § 172.202(a)(1) and (2) and (3)), or

(iii) Must be identified by the entry of an "X" placed before the proper shipping name in a column captioned "HM". (The "X" may be replaced by "RQ" if appropriate.)

(2) The required shipping description on a shipping paper and all copies thereof used for transportation purposes, must be legible and printed (manually or mechanically) in English.

(3) Unless it is specifically authorized or required in this subpart, the required shipping description may not contain any code or abbreviation.

(4) A shipping paper may contain additional information concerning the material provided the information is not inconsistent with the required description. Unless otherwise permitted or required by this subpart, additional information must be placed after the basic description required by § 172.202(a).

(i) When appropriate, the entries "IMCO" or "IMCO Class" may be entered immediately before or immediately following the class entry in the basic description.

(ii) For a material meeting the definition of more than one hazard class, the additional hazard class or classes may be entered after the hazard class in the basic description.

(Source: 7 Ill. Reg 3486, effective April 2, 1983)

§ 172.202 DESCRIPTION OF HAZARDOUS MATERIAL ON SHIPPING PAPERS.

(a) Each description of a hazardous material on the shipping paper must include -

(1) The proper shipping name prescribed for the material as required by § 172.101;

(2) The hazard class prescribed for the material in § 172.101. Except for a proper shipping name that contains words describing more than one hazard class, inclusion of the hazard class is not required when the words of the proper shipping name contain the key word or words of the hazard class of the material, such as Flammable liquid; Poison B, liquid; Radioactive device; or Corrosive liquid;

(3) The identification number (preceded by "UN" or "NA" as appropriate) prescribed for the material in § 172.101; and

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(4) Except for empty packagings, and as provided in § 172.215, the total quantity (by weight, volume, or as otherwise appropriate) of the hazardous material covered by the description.

(b) Except as provided in this subpart the basic description specified in paragraphs (a)(1), and (a)(2) and (a)(3) of this section must be shown in sequence. For example: "Gasoline, Flammable liquid" UN1203."

(c) The total quantity of the material covered by one description must appear before or after, or both before and after, the description required and authorized by this subpart.

(1) Abbreviations may be used to specify the type of packaging and weight or volume. For example: "40 cyl. Nitrogen, Non-flammable gas, UN1066, 800 pounds; 1 box Cement, liquid n.o.s., Flammable liquid, NA1133, 25 lbs.

(2) The type of packaging and destination marks may be entered in any appropriate manner before or after the basic description.

(d) Technical and chemical group names may be entered in parentheses between the proper shipping name and hazard class.

(Source: 7 Ill. Reg 3486, effective April 2, 1983)

§ 172.203 ADDITIONAL DESCRIPTION REQUIREMENTS.

(a) Exemptions. Each shipping paper issued in connection with a shipment made under an exemption must bear the notation "DOT-E or IDOT-E, as appropriate," followed by the exemption number assigned and so located that the notation is clearly associated with the description to which the exemption applies.

(b) Blasting caps. The description for a shipment of blasting caps must have an entry stating the number of caps in the shipment, either before or after the basic description.

(c) Hazardous substances.

(1) If the proper shipping name for a mixture or solution that is a hazardous substance does not identify the constituents making it a hazardous substance, the name or names of such hazardous substance constituents as shown in § 172.101 shall be entered in association with the basic description.

(2) The letters "RQ" shall be entered on the shipping paper either before or after the basic description required by § 172.101 for each hazardous substance (see definition in § 171.8). For example: "RQ, Cresol, Corrosive material, NA 2076" or "Adipic acid, ORM-E, NA 9077, RQ"

(d) Radioactive material.

(1) The description for a shipment of radioactive material must include the following additional entries as appropriate:

(i) The name of each radionuclide in the radioactive material that is listed in § 173.390 of this subchapter. Abbreviations, e.g., "⁹⁹Mo" are authorized.

(ii) A description of the physical and chemical form of the material, if the material is not in special form (generic chemical description is acceptable for chemical form).

(iii) The activity contained in each package of the shipment in terms of curies, millicuries, or microcuries. Abbreviations are authorized.

(iv) The category of label applied to each package in the shipment. For example: "RADIOACTIVE WHITE-I."

(v) The transport index assigned to each package in the shipment bearing RADIOACTIVE YELLOW-II or RADIOACTIVE YELLOW-III labels.

(vi) For shipment of fissile radioactive materials -

(A) The words "Fissile Exempt," if the package is exempt pursuant to § 173.396(a) of this subchapter, or

(B) If not exempt, the fissile class of each package in the shipment, pursuant to § 173.389 (a) of this subchapter; and

(C) For a Fissile Class III shipment, the additional notation: "Warning - Fissile Class III Shipment: Do not Load More Than *** Packages per Vehicle." (Asterisks to be replaced by appropriate number.) "In Loading and Storage Areas, Keep at Least 20 Feet (6 Meters) from Other Packages Bearing Radioactive Labels."

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(D) If a Fissile Class III shipment is to be transported by water, the supplementary notation must also include the following statement: "For shipment by water, only one Fissile Class III shipment is permitted in each hold."

(vii) For a package approved by the U.S. Energy Research and Development Administration (ERDA) or U.S. Nuclear Regulatory Commission (USNRC), a notation of the package identification marking as prescribed in the applicable ERDA or USNRC approval. (See § 173.393a of the subchapter.)

(viii) For an export shipment or a shipment in a foreign made package, a notation of the package identification marking as prescribed in the applicable International Atomic Energy Agency (IAEA) Certificate of Competent Authority which has been issued for the package. (See § 173.393b(a)(3) of the subchapter).

(ix) For a shipment of radioactive materials being offered and accepted for transportation and transported within Illinois under the provisions of § 171.12(e) of this subchapter, the shipping paper shall be annotated with the following entry:

This shipment contains packages of Type A/low specific activity radioactive materials limited in accordance with the 1973 IAEA Regulations, pursuant to the provisions of 49 CFR § 171.12(e). (Nonapplicable entry to be deleted.)

(e) Empty packagings. (1) Except for a package that still contains a hazardous substance, the description on the shipping paper for an empty packaging containing the residue of a hazardous material may include the word(s) "EMPTY" or "EMPTY: Last contained ***" as appropriate in association with the basic description of the hazardous material last contained in the packaging.

(2) (Reserved)

(3) If a packaging contains a residue that is a hazardous substance, the description on the shipping paper shall be prefaced with the phrase "EMPTY: Last contained ***" and shall have "RQ" entered before or after the basic description.

(f) (Reserved)

(g) (Reserved)

(n) Transportation by highway. Following the basic description for a hazardous material in a spec. MC 330 or MC 331 cargo tank made of quenched and tempered steel, there must be entered for -

(1) Anhydrous ammonia:

(i) The words "0.2 percent water" to indicate the suitability for shipping anhydrous ammonia in the cargo tank as authorized by § 177.817 of this subchapter, or

(ii) The words "NOT FOR Q AND T TANKS" when the anhydrous ammonia does not contain 0.2 percent or more water by weight.

(2) Liquefied petroleum gas: The word "Non-corrosive" or "Non-cor" to indicate the suitability for shipment of the "Non-corrosive" liquefied petroleum gas offered for transportation by cargo tank as authorized by § 173.315(a)(1), Note 15 of this subchapter.

(i) (Reserved)

(j) Dangerous When Wet. The words "Dangerous When Wet" shall be entered on the shipping paper in association with the basic description when a package covered by the basic description is required to be labeled with a DANGEROUS WHEN WET label.

(1) This requirement does not apply prior to January 1, 1983.

(k) Poisonous materials. Notwithstanding the class to which a material is assigned-

(1) If the name of the compound or principal constituent that causes a material to meet the definition of a poison (according to this subchapter) is not included in the proper shipping name for the material, the name of that compound or constituent shall be entered on the shipping paper in association with the shipping description for the material. The name of the compound or principal constituent may be either a technical name or any name for the material that is listed in the NIOSH Registry. This subparagraph does not apply to-

(i) A material having a proper shipping name that includes the chemical element or group which causes the material to be a poison.

(ii) Limited Quantities.

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(2) If a liquid or solid material in a package meets the definition of a poison according to this subchapter, and the fact that it is a poison is not disclosed in the shipping name or class entry, the word "Poison" shall be entered on the shipping paper in association with the shipping description.

(3) The provisions of paragraphs (k)(1) and (2) of this section do not apply-

- (i) To consumer commodities, ORM-D; or
- (ii) To compounds or principal constituents that would cause death by corrosive destruction to tissue rather than by systemic poisoning; or
- (iii) Prior to January 1, 1983.

(Source: 7 Ill. Reg 3486, effective April 2, 1983)

§ 172.204 SHIPPER'S CERTIFICATION.

(a) General. Except as provided in paragraphs (b) and (c) of this section, each person who offers a hazardous material for transportation shall certify that the material offered for transportation is in accordance with this subchapter by printing (manually or mechanically) the following statement on the shipping paper containing the required shipping description:

This is to certify that the above-named materials are properly classified, described, packaged, marked and labeled, and are in proper condition for transportation according to the applicable regulations of the Department of Transportation.

NOTE: In line one of the certification in paragraph (a) of this section, the words "herein-named" may be substituted for the words "above-named."

(b) EXCEPTIONS. Except for a hazardous waste, no certification is required for hazardous materials offered for transportation by motor vehicle and transported -

- (1) In a cargo tank supplied by the carrier, or
- (2) By the shipper as a private carrier except for a hazardous material that is to be reshipped or transferred from one carrier to another.

(c) TRANSPORTATION BY AIR. When intermodal shipments involve transportation by air, certification containing the following language may be used in place of the certification required by paragraph (a) of this section:

I hereby certify that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked and labeled, and in proper condition for carriage by air according to applicable national governmental regulations.

(d) SIGNATURE. The certifications required by paragraph (a) or (c) of this section -

- (1) Must be legibly signed by a principal, officer, partner, or employee of the shipper or his agent; and
- (2) May be legibly signed manually, by typewriter, or by other mechanical means.

(Source: 7 Ill. Reg 3486, effective April 2, 1983)

§ 172.205 HAZARDOUS WASTE MANIFEST.

(a) No person may offer, transport, transfer, or deliver a hazardous waste (waste) unless a hazardous waste manifest (manifest) is prepared, signed, carried, and given as required of that person by this section.

(b) The shipper (generator) shall prepare the manifest in accordance with 40 CFR Part 262.

(c) The original copy of the manifest must be dated by, and bear the handwritten signature of, the person representing-

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- (1) The shipper (generator) of the waste at the time it is offered for transportation, and
- (2) The initial carrier accepting the waste for transportation.
- (d) A copy of the manifest must be dated by, and bear the handwritten signature of the person representing-
 - (1) Each subsequent carrier accepting the waste for transportation, at the time of acceptance, and
 - (2) The designated facility receiving the waste, upon receipt.
- (e) A copy of the manifest bearing all required dates and signatures must be-
 - (1) Given to a person representing each carrier accepting the waste for transportation,
 - (2) Carried during transportation in the same manner as required by this subchapter for shipping papers,
 - (3) Given to a person representing the designated facility receiving the waste,
 - (4) (Reserved).
 - (5) Retained by the shipper (generator) and by the initial and each subsequent carrier for three years from the date the waste was accepted by the initial carrier. Each retained copy must bear all required signatures and dates up to and including those entered by the next person who received the waste.
- (f) (Reserved).
- (g) (Reserved).
- (h) A hazardous waste manifest required by 40 CFR Part 262, containing all of the information required by the subpart, may be used as the shipping paper required by this subpart.

(Source: 7 Ill. Reg 3486, effective April 2, 1983)

§ 172.215 PERMANENT SHIPPING PAPERS.

- (a) Except for hazardous waste and hazardous substances, permanent shipping papers may be used for cargo tanks, showing the quantity of material in the tank as the maximum quantity of that hazardous material that could be carried in that tank. All other requirements of this subpart and § 177.817 of Part 177 must be met.

(Source: 7 Ill. Reg 3486, effective April 2, 1983)

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SUBPART D-MARKING.

§ 172.300 APPLICABILITY

(a) Each person who offers a hazardous material for transportation shall mark each package freight container, and transport vehicle containing the hazardous material in the manner required by this subpart.

(b) When assigned the function by this subpart, each carrier that transports a hazardous material shall mark each package, freight container, and transport vehicle containing the hazardous material in the manner required by this subpart.

(Source: 7 Ill. Reg 3486, effective April 2, 1983)

§ 172.301 GENERAL MARKING REQUIREMENTS.

(a) Except as provided by this subchapter, each person who offers for transportation a hazardous material in a packaging having a rated capacity of 110 gallons or less shall mark the package with the proper shipping name and identification number (preceded by "UN" or "NA" as appropriate) assigned to the material in § 172.101.

(1) The proper shipping name is not required to include the word "Waste" as specified by § 172.101(c)(10) if the package bears the EPA marking prescribed by 40 CFR 262.32.

(b) When it has been determined by the shipper that a package has been previously marked as required for the material it contains, it need not be remarked. (For empty packagings, see § 173.29 of this subchapter.)

(c) This section does not apply to-

(1) Display of identification numbers on packages containing Limited Quantities (see § 171.8 of this subchapter) or materials classed as ORM-D (see § 173.1200 of this subchapter) when packed with no other hazardous materials.

(2) Display of identification numbers on packagings having a rated capacity of 110 gallons or less filled for shipment prior to January 1, 1983.

(3) Display of new or changed proper shipping names for hazardous materials adopted under Department rulemaking Docket HM 82-008 on packages filled for shipment prior to January 1, 1983.

(Source: 7 Ill. Reg 3486, effective April 2, 1983)

§ 172.302 (RESERVED).

§ 172.304 MARKING REQUIREMENTS.

(a) The marking required in this subpart -

(1) Must be durable, in English and printed on or affixed to the surface of a package or on a label, tag, or sign.

(2) Must be displayed on a background of sharply contrasting color;

(3) Must be unobscured by labels or attachments; and

(4) Must be located away from any other marking (such as advertising) that could substantially reduce its effectiveness.

§ 172.306 CONSIGNEE'S OR CONSIGNOR'S NAME AND ADDRESS.

(a) Each package containing a hazardous material offered for transportation must be marked with the name and address of the consignee or consignor except when the package is -

(1) Transported by highway and will not be transferred from one motor carrier to another, or

(2) Part of a carload lot, truckload lot, or freight container load, and the entire contents of the rail car, truck or freight container are tendered from one consignor to one consignee, or

(3) A portable tank, cargo tank or tank car tank.

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§ 172.308 AUTHORIZED ABBREVIATIONS.

(a) Abbreviations may not be used in a proper shipping name marking except in the following instances -

(1) For marking descriptions of ammunition, such as ammunition for cannon without projectiles, etc., the words "with" or "without" may be abbreviated as "W" or "W/O" for example: "ammunition for cannon W/O projectiles."

(2) The abbreviation "ORM" may be used in place of the words "Other Regulated Materials."

(Source: 7 Ill. Reg 3486, effective April 2, 1983)

§ 172.310 RADIOACTIVE MATERIALS.

(a) In addition to any other markings required by this subpart, each package containing radioactive materials must be marked as follows:

(1) Each package of radioactive materials in excess of 110 pounds (50 kilograms) must have its gross weight plainly and durably marked on the outside of the package.

(2) Each package of radioactive materials which conforms to the requirements for Type A or Type B packaging (§§ 173.389(j) and (k) and 173.399(b) and (c) of this subchapter) must be plainly and durably marked on the outside of the package in letters at least 1/2-inch (13 mm.) high, with the words "TYPE A" or "TYPE B" as appropriate. A packaging which is not in compliance with these requirements may not be so marked.

§ 172.312 LIQUID HAZARDOUS MATERIALS.

(a) Except as provided in this section and for limited quantities of flammable liquids packed in inside packagings of one quart or less, each package having an inside packaging containing liquid hazardous materials must be -

(1) Packed with closures upward, and

(2) Legibly marked "THIS SIDE UP" or "THIS END UP" as appropriate, to indicate the upward position of the inside packaging.

(b) Except as otherwise prescribed in Part 173 of this subchapter cylinders of liquefied compressed gas and specification containers 6D, 37M, 37P, and 21P are not required to be marked "THIS SIDE UP" or "THIS END UP".

(c) Arrows for purposes other than indicating proper package orientation may not be displayed on a package containing a hazardous material that is a liquid.

(1) An arrow symbol indicating "This Way Up" as specified in ANSI MH6.11968 entitled "Pictorial Marking for Handling of Goods" should be used in addition to the marking required by this section and § 173.25 of this subchapter.

§ 172.316 PACKAGINGS CONTAINING MATERIAL CLASSED AS ORM.

(a) Each packaging having a rated capacity of 110 gallons or less and containing a material classed as ORM-E must be plainly, durably, and legibly marked on at least one side or end with the appropriate ORM designation immediately following or below the proper shipping name of the material. The appropriate ORM designation must be placed within a rectangle that is approximately 1/4 inch (6.3 mm.) larger on each side than the designation. The appropriate designation must be ORM-E for an ORM-E.

(b) (RESERVED)

(c) The marking ORM-E is the certification by the person offering the package for transportation that the material is properly described, classed, packaged, marked and labeled (when appropriate) and in proper condition for transportation according to the applicable regulations of this subchapter. This form of certification does not preclude the requirement for a certificate on a shipping paper when required by Subpart C of this Part.

(Source: 7 Ill. Reg 3486, effective April 2, 1983)

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§ 172.324 HAZARDOUS SUBSTANCES.

(a) If the proper shipping name for a mixture or solution that is a hazardous substance does not identify the constituents making it a hazardous substance, the name or names of such hazardous substance constituents as shown in § 172.101 shall be entered in association with the proper shipping name on each packaging having a capacity of 110 gallons or less.

(b) The letters RQ shall be displayed in association with the proper shipping name on a packaging having a capacity of 110 gallons or less that contains a hazardous substance.

(c) This section does not apply prior to July 1, 1983.

(Source: 7 Ill. Reg 3486, effective April 2, 1983)

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ILLINOIS HAZARDOUS MATERIALS TRANSPORTATION REGULATIONS

§ 172.326 PORTABLE TANKS.

(a) No person may offer for transportation or transport a portable tank containing a hazardous material unless it is legibly marked with letters or numerals, as required, measuring no less than two inches (50.8 mm.) in height--

(1) On two opposing sides with the proper shipping name of the material, and

(2) As prescribed by § 172.332, with the identification number specified for the material in § 172.101 of these regulations or as authorized by 49 CFR § 172.102, and

(i) On each side and each end, if the tank has a capacity of 1,000 gallons or more, or

(ii) On two opposing sides in association with the proper shipping name, if the tank has a capacity of less than 1,000 gallons.

(b) A portable tank marked with the name or identification number of a hazardous material may not be used to transport any other material unless the marking is removed, or changed to identify the hazardous material in the portable tank, whichever is appropriate.

(c) The name of the owner, or when appropriate, of the lessee, must be legibly displayed on a portable tank that contains a hazardous material.

(d) If the marking required by paragraph (a)(2) of this section is not visible, a transport vehicle, or freight container used to transport a portable tank must be marked on each side and each end as required by § 172.332 with the identification number specified for the material in § 172.101 of these regulations or as authorized by 49 CFR § 172.102.

(e) Each portable tank marked as required by paragraph (a) of this section must remain marked unless it is--

(1) Filled with a material not subject to this subchapter; or

(2) Sufficiently cleaned of residue and purged of vapor to remove any potential hazard.

(Source: 7 Ill. Reg 3486, effective April 2, 1983)

§ 172.328 CARGO TANKS.

(a) Except as provided in this subpart, no person may offer for transportation or transport a hazardous material in a cargo tank unless the cargo tank is marked as required by § 172.332 on each side and each end with the identification number specified for the material in § 172.101 or 49 CFR, § 172.102 (when authorized).

(1) A person who offers a motor carrier a hazardous material for transportation in a cargo tank shall provide the motor carrier the required identification numbers on placards or shall affix orange panels containing the required identification numbers, prior to or at the time the material is offered for transportation unless the cargo tank is already marked with the identification number required by this subpart in accordance with paragraph (f) of this section and § 173.29(c) of this subchapter.

(2) A person who offers a cargo tank containing a hazardous material for transportation shall affix the required identification numbers on panels or placards prior to or at the time the cargo tank is offered for transportation unless it is already marked with identification numbers as required by this subpart.

(b) When the name of a material is required by this subchapter to be marked on a cargo tank, it must be legibly displayed on each end and each side in lettering no less than two inches (50.8 mm.) in height.

(c) REQUIRED MARKINGS: GASES. Each cargo tank transporting flammable or nonflammable compressed gas subject to this subchapter must be marked as specified in this Part on each end and each side with -

(1) The proper shipping name of the gas, or

(2) An appropriate common name for the material such as "Refrigerant Gas."

(d) QT/NQT MARKING FOR MC 330 AND MC 331 CARGO TANKS. Each spec. MC 330 and MC 331 cargo tank must be appropriately marked "QT" or "NQT" to indicate it is constructed of quenched and tempered steel (QT) or other than quenched and tempered steel (NQT). These markings must be placed near the specification identification plate.

(e) A cargo tank marked with the name or identification number of a specific hazardous material may not be used to transport any other material unless the marking is removed, or changed to identify the hazardous material in the cargo tank, whichever is appropriate.

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(f) A cargo tank that is required to be marked with the name or identification number of a hazardous material must remain marked when empty unless it is-

- (1) Reloaded with a material not subject to this subchapter; or
- (2) Sufficiently cleaned of residue and purged of vapor to remove any potential hazard.

(Source: 7 Ill. Reg 3486, effective April 2, 1983)

§ 172.330 TANK CAR TANKS.

- (a) (RESERVED)
- (b) (RESERVED)

(c) No person may offer for transportation or transport, a hazardous material in a tank car tank unless it is marked on opposing sides, in letters and numerals no less than two inches high, with the -

(1) Proper shipping name specified for the material in § 172.101 or 49 CFR § 172.102, or common name authorized for the material in this subchapter, and

(2) Identification number specified for the material in § 172.101 or 49 CFR, § 172.102, when authorized).

(d) A tank car tank marked with the identification number or name of a specific hazardous material may not be used to transport any other material unless the marking is removed, or changed to identify the hazardous material the tank car tank contains, whichever is appropriate.

(e) A motor vehicle used to transport a multi-unit tank car tank must be marked on each side and each end, as required by § 172.332, with the identification number specified for the material in 49 CFR § 172.101 or 49 CFR § 172.102 (when authorized).

(f) If a tank car tank contains chlorine, marking of the name "Chlorine" is not required when the CHLORINE label is used as provided in § 172.405(b).

(g) Each tank car tank (except when it contains a combustible liquid) must remain marked when empty unless-

- (1) Reloaded with a material not subject to this subchapter, or
- (2) Sufficiently cleaned of residue and purged of vapor to remove any potential hazard.

(h) Display of identification numbers on multi-unit tank car tanks is not required prior to July 1, 1983.

(Source: 7 Ill. Reg 3486, effective April 2, 1983)

§ 172.332 IDENTIFICATION NUMBER MARKINGS

(a) General: When required by this subpart, identification numbers shall be displayed on orange panels or placards as specified in this section.

(b) Orange panels: Display of an identification number on an orange panel shall be in conformance with the following:

(1) The orange panel must be 6 1/4 inches (16 cm.) high by 15 3/4 inches (40 cm.) wide with a 9/16 inch (15 mm.) black outer border. The identification number shall be displayed in 4-inch (10 cm.) black Helvetica medium numerals on the orange panel. Measurements may vary from those specified plus or minus 0.2 of an inch (5 mm.).

(2) The orange panel may be made of any durable material prescribed for placards in § 172.519, and shall be of the orange color specified for labels or placards in Appendix A to this Part.

(3) The name and hazard class of a material represented by the identification number may be shown in the upper left border of the orange panel in letters not more than 1/4 inch (18 points) high.

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(4) Except for size and color, the orange panel and identification numbers shall be as illustrated for Liquefied petroleum gas:

(c) Placards: Display of an identification number on a hazard warning placard shall be in conformance with the following:

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(1) The identification number shall be displayed across the center area of the placard in 3 1/2 inch (89 mm.) black Alpine Gothic or Alternate Gothic No. 3 numerals on a white background 4 inches (10 cm.) high and approximately 8 1/2 inches (21.5 cm.) wide.

(2) The top of the 4-inch (10 cm.) high white background shall be approximately 1 5/8 inches (40.0 mm.) above the placard horizontal center line.

(3) When an identification number is displayed on a placard the United Nations hazard class number for the material shall be displayed in the lower corner of each placard as specified in § 172.519(d).

(4) For a COMBUSTIBLE placard used to display an identification number, the entire background below the white background for the identification number must be white during transportation by highway.

(5) The name of the hazardous material and the hazard class may be shown in letters not more than 1/4 inch (18 points) high immediately within the upper border of the space on the placard bearing the identification number of the material.

(6) If an identification number is placed over the word(s) on a placard, the word(s) should be substantially covered to maximize the effectiveness of the identification number.

(d) Except for size and color, the display of an identification number on a placard shall be as illustrated for Acetone:



(Source: 7 Ill. Reg 3486, effective April 2, 1983)

§ 172.334 IDENTIFICATION NUMBERS: PROHIBITED DISPLAY.

(a) An identification number may not be displayed on a POISON GAS, RADIOACTIVE or EXPLOSIVES placard.

(b) An identification number may not be displayed on an orange panel or a placard affixed to any package freight container or transport vehicle that does not contain a hazardous material associated with that identification number in § 172.101 or 49 CFR § 172.102 (when authorized).

(c) Except as required by § 172.332(c)(4) for a combustible liquid, the identification number of a material may not be displayed on a placard other than the one required by Subpart F of this Part for the material.

(d) Except as provided in § 172.336, a placard bearing an identification number may not be used to meet the requirements of Subpart F of this Part unless it is the correct identification number for all hazardous materials of the same class in the transport vehicle or freight container on which it is displayed.

(e) Except as specified in § 172.338, an identification number may not be displayed on an orange panel on a cargo tank unless affixed to the cargo tank by the person offering the hazardous material for transportation in the cargo tank.

(f) If a placard is required by § 172.504, an identification number may not be displayed on an orange panel unless it is displayed in proximity to the placard.

(Source: 7 Ill. Reg 3486, effective April 2, 1983)

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§ 172.336 IDENTIFICATION NUMBERS: SPECIAL PROVISIONS AND EXCEPTIONS

(a) When not required or prohibited by this subpart, identification numbers may be displayed on a transport vehicle or a freight container in the manner prescribed by this subpart.

(b) For hazardous materials in hazard classes for which placards are not required, identification numbers may be displayed on a plain white square-on-point configuration having the same outside dimensions as those prescribed by this Part for placards. An identification number displayed as authorized by this paragraph is not considered a placard.

(1) The 4-inch (10 cm.) by 8 1/2 inch (21.5 cm.) area containing the identification number shall be located as prescribed by § 172.332 (c)(2) and (c)(3) and may be outlined with a solid or dotted line border.

(c) Identification numbers are not required-

(1) On the ends of a portable tank, cargo tank or tank car having more than one compartment if hazardous materials having different identification numbers are being transported therein. In such a circumstance, the identification numbers on the sides of the tank shall be displayed in the same sequence as the compartments containing the materials they identify.

(2) On a cargo tank containing only gasoline, if the cargo tank is marked "Gasoline" on each side and rear in letters no less than 2 inches high, or is placarded in accordance with § 172.542(c).

(3) On a cargo tank containing only fuel oil, if the cargo tank is marked "Fuel Oil" on each side and rear in letters no less than 2 inches high, or is placarded in accordance with § 172.544(c).

(4) For different liquid distillate fuels, including gasoline, in a compartmented cargo tank or tank car, if the identification number is displayed for the distillate fuel having the lowest flash point.

(5) For each of the different liquid distillate fuels, including gasoline, transported in a cargo tank, if the identification number is displayed for the liquid distillate fuel having the lowest flash point.

(6) On nurse tanks meeting the provisions of § 171.6 or § 173.315(m) of this subchapter.

(7) On tank car tanks prior to July 1, 1983.

(8) On orange panels or placards prior to January 1, 1983.

(Source: 7 Ill. Reg 3486, effective April 2, 1983)

§ 172.338 REPLACEMENT OF IDENTIFICATION NUMBERS.

If more than one of the identification number markings on the placards or orange panels that are required to be displayed are lost or destroyed during transportation, the carrier shall replace all the missing identification numbers(s) as soon as practicable. However, in such a case, the numerals may be entered legibly by hand using an indelible marking material. This section does not preclude required compliance with the placarding requirements of this subchapter.

(Source: 7 Ill. Reg 3486, effective April 2, 1983)

ILLINOIS HAZARDOUS MATERIALS TRANSPORTATION REGULATIONS

SUBPART E-LABELING

§ 172.400 GENERAL LABELING REQUIREMENTS.

(a) Except as otherwise provided in this subchapter, each person who offers a package, overpack, or freight container containing a hazardous material for transportation shall label it, when required, with labels prescribed for the material as specified in § 172.101 or 49 CFR § 172.102 (when authorized) and in accordance with this subpart.

(b) A label is not required on a -

(1) Package for which labeling is not required under the conditions set forth in this subchapter and in this section;

(2) Cylinder containing a compressed gas classed as flammable or nonflammable that is -

(i) Carried by a private or contract motor carrier;

(ii) Not overpacked; and

(iii) Durably and legibly marked in accordance with CGA Pamphlet C-7, Appendix A.

(3) Military ammunition shipped by, for, or to the U.S. Department of Defense (DOD) when in freight container load, carload or truckload shipments, if loaded and unloaded by the shipper, or DOD.

(4) Package containing a hazardous material other than ammunition that is -

(i) Loaded and unloaded under the supervision of DOD personnel, and

(ii) Escorted by DOD personnel in a separate vehicle.

(5) Compressed gas cylinder permanently mounted in or on a transport vehicle;

(6) Portable tank which is placarded in accordance with § 172.514;

(7) Freight container having a volume of 640 cubic feet or more which is subject to § 172.512;

(8) Package containing a material classed as ORM-A, B, C, or D, E if that package does not contain any other material classed as a hazardous material that requires labeling.

(9) Package containing a combustible liquid; or

(10) Package of low specific activity radioactive material, when being transported in a transport vehicle assigned for the sole use of the consignor under § 173.392(b) of this subchapter.

(11) Cargo tank.

(c) (Reserved)

(d) Except as provided in paragraph (b) of this section, when the proper shipping name marked on a package is a proper shipping name from 49 CFR § 172.102 that does not appear in § 172.101, the package must be labeled as provided in 49 CFR § 172.102.

(Source: 7 Ill. Reg 3486, effective April 2, 1983)

§ 172.401 PROHIBITED LABELING.

(a) Except as provided in paragraphs (c) and (d) of this section, no person may offer for transportation and no carrier may transport any package bearing a label specified in this subpart unless -

(1) The package contains a material that is a hazardous material, and

(2) The label represents a hazard of the hazardous material in the package.

(b) No person may offer for transportation and no carrier may transport a package bearing any marking or label which by its color, design, or shape could be confused with or conflict with a label prescribed by this Part.

(c) The restrictions in paragraphs (a) and (b) of this section, do not apply to packages labeled in conformance with -

(1) Any United Nations recommendation, including the class number (see § 172.407), in the document entitled "TRANSPORT OF DANGEROUS GOODS (1970)," or

(2) The Intergovernmental Maritime Consultative Organization (IMCO) requirements, including the class number (see § 172.407), in the document entitled "International Maritime Dangerous Goods Code."

(d) A package containing a sample of a hazardous material, other than an explosive, must be labeled in accordance with § 172.402(h).

ILLINOIS HAZARDOUS MATERIALS TRANSPORTATION REGULATIONS

§ 172.402 ADDITIONAL LABELING REQUIREMENTS.

(a) MULTIPLE LABELING. Each package containing a material meeting the definition of more than one hazard class must be labeled as follows:

(1) A material classed as an Explosive A, Poison A, or Radioactive material that also meets the definition of another hazard class, must be labeled as required for each class.

(2) A Poison B liquid that also meets the definition of a Flammable liquid must be labeled POISON and FLAMMABLE LIQUID.

(3) A material classed as Oxidizer, Flammable solid or Flammable liquid that also meets the definition of a Poison B must be labeled POISON in addition to the class label.

(4) A material classed as a Flammable solid that also meets the definition of a water reactive material must have both the FLAMMABLE SOLID and DANGEROUS WHEN WET labels affixed.

(5) A material classed as a Corrosive material that also meets the definition of a Poison B shall be labeled with a POISON label in addition to the class label. This subparagraph does not apply to a material that would cause death due to corrosive destruction of tissue rather than by systemic poisoning.

(6) A material classed as a Poison B that also meets the definition of a corrosive material shall be labeled with a CORROSIVE label in addition to the class label.

(7) A material classed as a Flammable liquid that also meets the definition of a Corrosive material shall be labeled with a CORROSIVE label in addition to the class label.

(8) A material classed as a Flammable solid that also meets the definition of a Corrosive material shall be labeled with a CORROSIVE label in addition to the class label.

(9) A material classed as an Oxidizer that also meets the definition of a Corrosive material shall be labeled with a CORROSIVE label in addition to the class label.

(10) The requirements of subparagraphs (5) through (9) of this paragraph do not apply prior to July 1, 1983.

(b) (Reserved)

(c) DANGEROUS WHEN WET LABEL. Each person who offers for transportation a package containing a hazardous material must affix to the package a DANGEROUS WHEN WET label as described in § 172.423 when required by § 172.101.

(d) (Reserved)

(e) BUNG LABEL. Each metal barrel or drum containing a flammable liquid having a vapor pressure between 16 and 40 p.s.i.a. at 100° F. must have affixed a BUNG label as specified in § 173.119(i) of this subchapter in addition to a FLAMMABLE LIQUID label described in § 172.419.

(f) ETIOLOGIC AGENTS LABEL. See §§ 172.444 and 173.388 of this subchapter for ETIOLOGIC AGENTS labeling requirements.

(g) EMPTY LABEL. See § 173.29 of this subchapter for EMPTY labeling requirements.

(h) PACKAGES CONTAINING SAMPLES. Except as provided in §§ 173.21 and 173.86 of this subchapter, a material for which a reasonable doubt exists as to its class and labeling requirements, and for which a sample must be transported for laboratory analysis may be labeled according to the shipper's tentative class assignment based upon -

(1) Defining criteria in this subchapter;

(2) The hazard precedence prescribed in § 173.2 of this subchapter; and

(3) The shipper's knowledge of the material.

(i) LABELS FOR DOT SPECIFICATION 106 AND 110 TANKS. A DOT spec.106 or 110 tank must be labeled on each end as required by this subchapter for the hazardous material it contains.

(Source: 7 Ill. Reg 3486, effective April 2, 1983)

§ 172.403 RADIOACTIVE MATERIAL.

(a) Unless excepted from labeling by §§ 173.391 or 173.392 of this subchapter, each package of radioactive material must be labeled as provided in this section.

(b) A RADIOACTIVE WHITE-I label must be affixed to each package measuring 0.5 millirem or less per hour at each point on the external surface of the package, provided the package -

(1) Is not a Fissile Class II or III, or

(2) Does not contain a "large quantity" of radioactive material, as defined in § 173.389 of this subchapter.

(c) A RADIOACTIVE YELLOW-II label must be affixed to each -

(1) Package measuring more than 0.5 but not more than 50 millirem per hour at each point, and not exceeding one (1.0) millirem per hour at three feet from each point on the external surface of the package.

(2) Fissile Class II package having a transport index of one (1.0) or less.

(d) A RADIOACTIVE YELLOW-III label must be affixed to each package which -

(1) Measures more than 50 millirem per hour at each point or exceeds one (1.0) millirem per hour at three feet from each point on the external surface;

(2) Is a Fissile Class III; or

(3) Contains a "large quantity" of radioactive material as defined in § 173.389 of this subchapter.

(e) Each package containing a radioactive material that also meets the definition of one or more additional hazards must be labeled as a radioactive material as required by this section and for each additional hazard. For example:

(1) Packages containing the solid nitrates of uranium or thorium must be labeled RADIOACTIVE and OXIDIZER.

(2) Packages containing nitric acid solutions of radioactive material must be labeled RADIOACTIVE and CORROSIVE.

(f) Each package required by this section to be labeled with a RADIOACTIVE label must have two of these labels, affixed to opposite sides of the package. (See § 172.406(e)(3) for freight container label requirements).

(g) The following applicable items of information must be entered in the blank spaces on the RADIOACTIVE label by legible printing (manual or mechanical), using a durable weather resistant means of marking:

(1) "Contents." The name of the radionuclides as taken from the listing of radionuclides in § 173.390 (symbols which conform to established radiation protection terminology are authorized, i.e., ⁹⁹Mo, ⁶⁰Co, etc.). For mixtures of radionuclides, the most restrictive radionuclides on the basis of radiotoxicity must be listed as space on the label allows.

(2) "Number of curies." Units shall be expressed in appropriate curie units, i.e., curies (Ci), millicuries (mCi) or microcuries (uCi) (abbreviations are authorized). For a fissile material, the weight in grams or kilograms of the fissile radioisotope also may be inserted.

(3) "Transport index." (See § 173.389(i).)

§ 172.404 LABELS FOR MIXED AND CONSOLIDATED PACKAGING.

(a) MIXED PACKAGING. When hazardous materials having different hazard classes are packed within the same packaging, or within the same outside container or overpack as described in § 173.25 and authorized by § 173.21 of this subchapter, the packaging, outside container or overpack must be labeled as required for each class of hazardous material contained therein.

(b) CONSOLIDATED PACKAGING. When two or more packages containing compatible hazardous material (see § 173.21) are placed within the same outside container or overpack, the outside container or overpack must be labeled as required for each class of hazardous material contained therein.

§ 172.405 AUTHORIZED LABEL MODIFICATIONS.

(a) For a package containing Oxygen, the word "OXYGEN" may be used in the place of the word "OXIDIZER" on the OXIDIZER label provided the letter size and color for OXYGEN are the same as those required for OXIDIZER.

(b) For a package containing Chlorine, the word "CHLORINE" may be used in the place of the word "POISON" on the POISON label provided the letter size and color for CHLORINE are the same as those required for POISON;

(1) A CHLORINE label may be used in place of the NON-FLAMMABLE GAS and POISON labels required for Chlorine by § 172.101.

ILLINOIS HAZARDOUS MATERIALS TRANSPORTATION REGULATIONS

§ 172.406 PLACEMENT OF LABELS.

(a) GENERAL. Except as provided in paragraphs (b) and (e) of this section, each label required by this subpart must be printed on or affixed to the surface of the package near the marked proper shipping name required by Subpart D of this part.

(b) EXCEPTIONS. Labels may be printed on or placed on a securely affixed tag, or may be affixed by other suitable means to -

(1) A package that contains no radioactive material and which has dimensions less than those of the required label;

(2) A compressed gas cylinder; and

(3) A package which has such an irregular surface that a label cannot be satisfactorily affixed.

(c) PLACEMENT OF MULTIPLE LABELS. When two or more different labels are required, they must be displayed or affixed next to each other.

(d) LABEL BORDER. Each label must be affixed to a background of contrasting color, or must have a dotted or solid line outer border.

(e) ADDITIONAL LABELING. When labeling is required, the labels must be displayed on at least two sides or two ends (excluding the bottom) of -

(1) Each package containing a radioactive material;

(2) Each package having a volume of 64 cubic feet or more; and

(3) Each freight container having a volume of 64 cubic feet or more, but less than 640 cubic feet, except when placarded in accordance with § 172.512(b).

(i) Placarding may not be used instead of labeling on a package containing radioactive material.

(ii) When labeled, one of each of the appropriate labels must be displayed on or near the closure.

(4) Each portable tank having a rated capacity of less than 1,000 gallons, except when placarded in accordance with § 172.514(a).

(f) OBSCURED LABELS. A label must not be obscured by markings or attachments.

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§ 172.407 LABEL SPECIFICATIONS.

(a) Each label, affixed to or printed on a package, must be durable and weather resistant. Black and any color on a label must be able to withstand, without substantial change -

(1) A 72-hour fadeometer test (for a description of equipment designed for this purpose, see ASTM G 23-69 (1975), or ASTM G 26-70); and

(2) A 30-day exposure to conditions incident to transportation that reasonably could be expected to be encountered by the labeled package.

(b) Each diamond (square-on-point) label prescribed in this part must be at least 4 inches (101 mm.) on each side with each side having a black solid line border 1/4-inch (6.3 mm.) from the edge.

(c) Except for size and color, the printing, inner border, and symbol on each label must be as shown for each label.

(d) The colors for each label must be as specified in this subpart and the specifications for each color should be as prescribed in Appendix A to this part.

(1) The technical specifications for each chart are set forth in Appendix A to this Part.

(2) The requirements of paragraph (d) of this section do not apply to labels printed directly onto the surface of a packaging before March 1, 1979: PROVIDED, The colors of such labels comply with the appropriate colors described in §§ 172.411 through 172.450. To the extent possible, the colors of such labels should meet the requirements of paragraph (d) of the card is not part of the placard specification. However, a dotted or solid line outer border may be used when needed to indicate CORROSIVE, MAGNETIZED MATERIAL, RADIOACTIVE YELLOW-II, and RADIOACTIVE YELLOW-III labels.

(f) A label may contain form identification information, including the name of its maker, provided that information is printed outside of the solid line inner border in no larger than 10-point type.

(g) A label may contain the United Nations and Inter-Governmental Maritime Consultative Organization (IMCO) hazard class number and, when appropriate the division number. The number must be -

(1) Black, unless it is on a CORROSIVE label when it must be white, or unless other colors are authorized by this Part;

(2) Located in the lower corner of the label; and

(3) One-half inch (12.7 mm.) or less in height.

(h) For import shipments only, a label conforming to the requirements of IMCO or the United Nations Recommendations affixed to a package in another country may contain inscriptions required by the country of origin.

(i) The dotted line border shown on each label is not part of the label specification, except when used as an alternative for the solid line outer border to meet the requirements of § 172.406(d).

(j) EXPLOSIVE A, EXPLOSIVE B, and EXPLOSIVE C labels may bear inscriptions in addition to those prescribed in this subpart, if required for import or export purposes.

(Source: 7 Ill. Reg 3486, effective April 2, 1983)

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§ 172.411 EXPLOSIVE A, EXPLOSIVE B, EXPLOSIVE C AND BLASTING AGENTS LABELS.

(a) Except for size and color, the EXPLOSIVE A, EXPLOSIVE B, and EXPLOSIVE C labels must be as follows:



(b) In addition to complying with § 172.407, the EXPLOSIVE A, EXPLOSIVE B, and EXPLOSIVE C labels must be orange. The printing and symbol must be black.

(Source: 17 Ill. Reg 4287, effective April 16, 1982)

[Remainder of this page intentionally left blank.]

(c) Except for size and color, the BLASTING AGENT label must be as follows:



(d) In addition to complying with § 172.407, the BLASTING AGENT label must be orange. The printing must be black.

§ 172.415 NON-FLAMMABLE GAS LABEL.

(a) Except for size and color, the NON-FLAMMABLE GAS label must be as follows:



(b) In addition to the requirements specified in § 172.407, the NON-FLAMMABLE GAS label must be green. The symbol and printing must be black or white. The solid line border and, if used, the hazard class number must be the color of the symbol.

(Source: 7 Ill. Reg 3486, effective April 2, 1983)

§ 172.416 POISON GAS LABEL.

(a) Except for size and color, the POISON GAS label must be as follows:



(b) In addition to complying with § 172.407, the POISON GAS label must be white. The printing must be black, and the symbol must be black and white.

§ 172.417 FLAMMABLE GAS LABEL.

(a) Except for size and color, the FLAMMABLE GAS label must be as follows:



(b) In addition to complying with § 172.407, the FLAMMABLE GAS label must be red. The printing and symbol must be black or white. The solid line border and, if used, the hazard class number must be the color of the symbol.

(Source: 7 Ill. Reg 3486, effective April 2, 1983)

§ 172.419 FLAMMABLE LIQUID LABEL.

(a) Except for size and color, the FLAMMABLE LIQUID label must be as follows:



(b) In addition to complying with § 172.407, the FLAMMABLE LIQUID label must be red. The printing and symbol must be black or white. The solid line border and, if used, the hazard class number must be the color of the symbol.

(Source: 7 Ill. Reg 3486, effective April 2, 1983)

§ 172.420 FLAMMABLE SOLID LABEL.

(a) Except for size and color, the FLAMMABLE SOLID label must be as follows:



(b) In addition to complying with § 172.407, the FLAMMABLE SOLID label must be white with vertical red stripes equally spaced on each side of a red strip in the center of the label. The rectangle for the words "FLAMMABLE SOLID" must be white. The printing and symbol must be black with the symbol overprinted. The words "FLAMMABLE SOLID" must not contact any red stripe. The white stripes must be sufficiently wider than the red stripes to make them appear visually equal in width.

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§ 172.422 SPONTANEOUSLY COMBUSTIBLE LABEL.

(a) Except for size and color, the SPONTANEOUSLY COMBUSTIBLE label must be as follows:



(b) In addition to complying with § 172.407, the SPONTANEOUSLY COMBUSTIBLE label must be red in the lower half and white in the upper half. The symbol and printing must be black.

(c) If use of the SPONTANEOUSLY COMBUSTIBLE label is required by the regulations of another country, it may be used in addition to the labels required by §§ 172.400 and 172.402.

§ 172.423 DANGEROUS WHEN WET LABEL.

(a) Except for size and color, the DANGEROUS WHEN WET label must be as follows:



(b) In addition to complying with § 172.407, the DANGEROUS WHEN WET LABEL must be blue. The printing and symbol must be black or white. The solid line border and, if used, the hazard class number must be the color of the symbol.

(c) If use of the DANGEROUS WHEN WET label is required by the regulations of another country, it may be used in addition to the labels required by §§ 172.400 and 172.402.

(Source: 7 Ill. Reg 3486, effective April 2, 1983)

§ 172.426 OXIDIZER LABEL.

(a) Except for size and color, the OXIDIZER label must be as follows (see § 172.405 for authorized label modification):



(b) In addition to complying with § 172.407, the OXIDIZER label must be yellow. The printing and symbol must be black.

§ 172.427 ORGANIC PEROXIDE LABEL.

(a) Except for size and color, the ORGANIC PEROXIDE label must be as follows:



(b) In addition to complying with § 172.407, the ORGANIC PEROXIDE label must be yellow. The printing and symbol must be black.

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§ 172.430 POISON LABEL.

(a) Except for size and color, the POISON label must be as follows (see § 172.405 for authorized label modification):



(b) In addition to complying with § 172.407, the POISON label must be white. The printing and symbol must be black.

§ 172.432 IRRITANT LABEL.

(a) Except for size and color, the IRRITANT label must be as follow:



(b) In addition to complying with § 172.407, the IRRITANT label must be white. The word "IRRITANT" must be red.

ILLINOIS HAZARDOUS MATERIALS TRANSPORTATION REGULATIONS

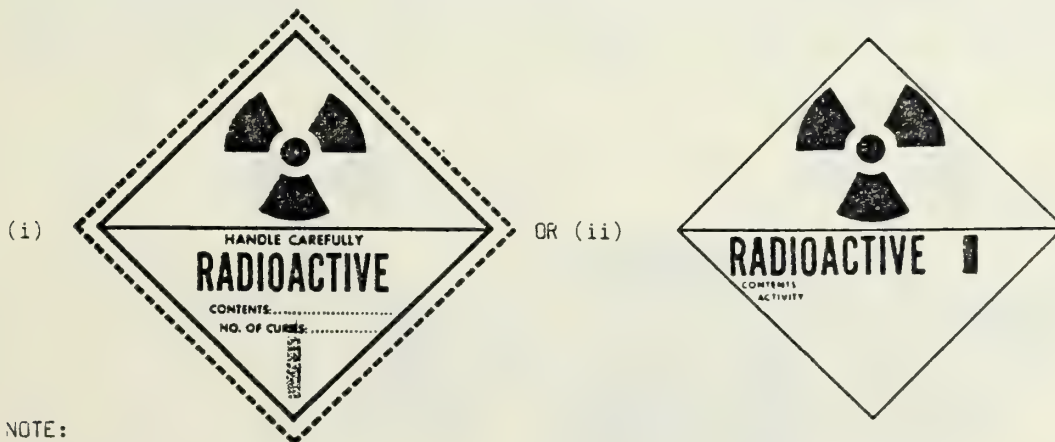
(c) For export shipments, if use of the following label is required for irritants by the regulations of another country, it may be used in place of the label for irritants required by § 172.400 and described in § 172.432. In addition to complying with § 172.407, this label for irritant, except for size and color, must be as follows:



(d) The printing and symbol must be black on a white background.

§ 172.436 RADIOACTIVE WHITE-I LABEL.

(a) Except for size and color, the RADIOACTIVE WHITE-I label, must be as follows:



NOTE:

Label (i) may be used
until July 1, 1983

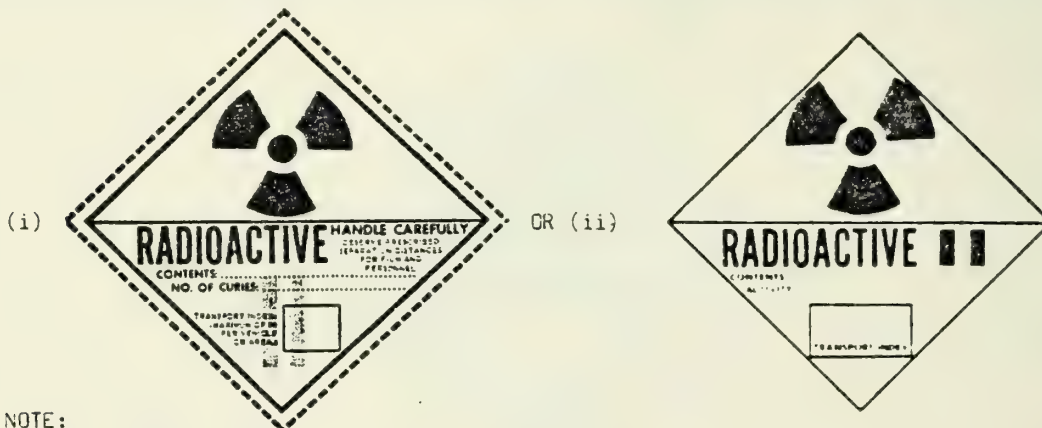
(b) In addition to complying with § 172.407, the RADIOACTIVE WHITE-I label must be white. The printing and symbol must be black except for the "I" which must be red.

(Source: 17 Ill. Reg 4287, effective April 16, 1982)

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§ 172.438 RADIOACTIVE YELLOW-II LABEL.

(a) Except for size and color, the RADIOACTIVE YELLOW-II label, must be as follows:



NOTE:

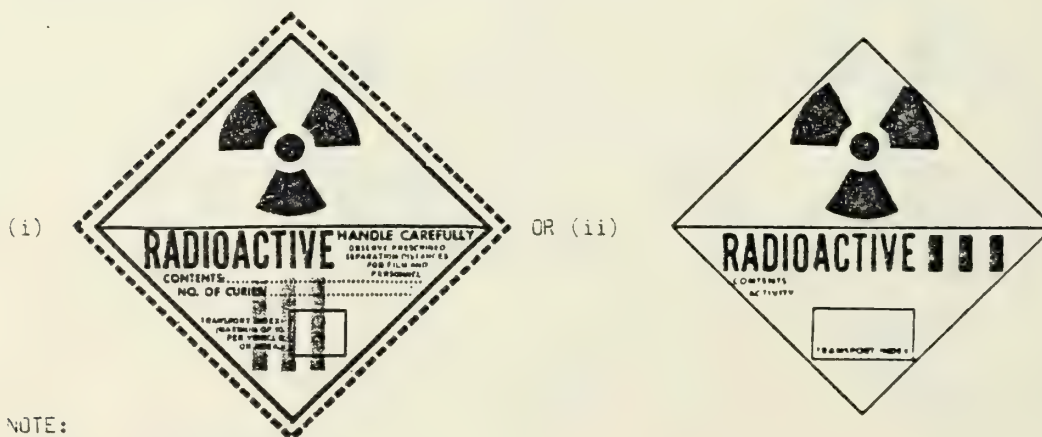
Label (i) may be used
until July 1, 1983

(b) In addition to complying with § 172.407, the RADIOACTIVE YELLOW-II label must be yellow in the top half and white in the lower half. The printing and symbol must be black, except for the "II" which must be red.

(Source: 17 Ill. Reg 4287, effective April 16, 1982)

§ 172.440 RADIOACTIVE YELLOW-III LABEL.

(a) Except for the size and color, the RADIOACTIVE YELLOW-III label must be as follows:



NOTE:

Label (i) may be used
until July 1, 1983

(b) In addition to complying with § 172.407, the RADIOACTIVE YELLOW-III label must be yellow in the top half and white in the lower half. The printing and symbol must be black, except for the "III" which must be red.

(Source: 17 Ill. Reg 4287, effective April 16, 1982)

ILLINOIS HAZARDOUS MATERIALS TRANSPORTATION REGULATIONS

§ 172.442 CORROSIVE LABEL.

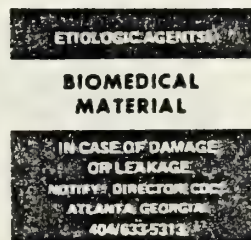
(a) Except for size and color, the CORROSIVE label must be as follows:



(b) In addition to complying with § 172.407, the CORROSIVE label must be white in the top half and black in the lower half. The printing must be white and the symbol must be black and white.

§ 172.444 ETIOLOGIC AGENT LABEL.

(a) Each package containing an Etiologic agent subject to this subchapter must be labeled as specified in § 173.388 of this subchapter.



ILLINOIS HAZARDOUS MATERIALS TRANSPORTATION REGULATIONS

(b) For export shipments, if use of the following label is required by the regulations of another country, it may be used in addition to the label required in paragraph (a) of this section for Etiologic agents. In addition to complying with § 172.407, this additional label for Etiologic agents, except for size and color, must be as follows:



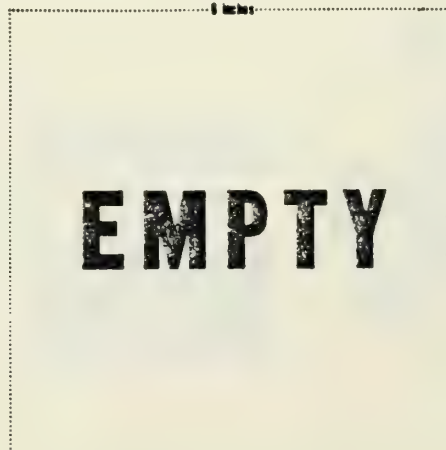
(c) The printing and symbol must be black on a white background.

§ 172.446 (RESERVED)

§ 172.448 (RESERVED)

§ 172.450 EMPTY LABEL.

(a) Each EMPTY label, except for size, must be as follows:



(1) Each side must be at least 6 inches (152 mm.) with each letter at least 1 inch (25.4 mm.) in height.

(2) The label must be white and black printing.

SUBPART F-PLACARDING

§ 172.500 APPLICABILITY OF PLACARDING REQUIREMENTS.

(a) Each person who offers for transportation or transports any hazardous material subject to this subchapter shall comply with the applicable placarding requirements of this subpart.

(b) This subpart does not apply to -

(1) Etiologic agents.

(2) Hazardous materials classed as ORM-A,B,C, D, or E, or

(3) Hazardous materials authorized by this subchapter to be offered for transportation as Limited Quantities when identified as such on shipping papers in accordance with § 172.203(b).

(Source: 7 Ill. Reg 3486, effective April 2, 1983)

§ 172.502 PROHIBITED PLACARDING.

(a) No person may affix or display on a cargo tank, portable tank, freight container, or motor vehicle any placard described in this subpart unless -

(1) The material being offered or transported is a hazardous material, and

(2) The placard represents a hazard of the hazardous material being offered or transported.

(b) No person may affix or display any sign or other device on a motor vehicle, cargo tank, portable tank, or freight container, that by its color, design, shape, or content could be confused with any placard prescribed in this subpart.

(Source: 17 Ill. Reg 4287, effective April 16, 1982)

§ 172.503 IDENTIFICATION NUMBER DISPLAY ON PLACARDS.

For procedures and limitations pertaining to the display of identification numbers on placards, see § 172.334.

(Source: 7 Ill. Reg 3486, effective April 2, 1983)

§ 172.504 GENERAL PLACARDING REQUIREMENTS.

(a) Except as otherwise provided in this subchapter, each motor vehicle and freight container containing any quantity of a hazardous material must be placarded on each end and each side with the type of placards specified in the following tables and other placarding requirements of this subpart, including the specifications for the placards named in the tables and described in detail in §§ 172.519 through 172.558.

(b) A freight container or motor vehicle containing two or more classes of materials requiring different placards specified in Table 2 may be placarded DANGEROUS in place of the separate placarding specified for each of those classes of material specified in Table 2. However, when 5,000 pounds or more of one class of material is loaded therein at one loading facility, the placard specified for that class in Table 2 must be applied. This paragraph does not apply to a portable tank or cargo tank.

(c) No placard is required on a motor vehicle, or a freight container if transported by highway only, containing less than 1,000 pounds (aggregate gross weight) of one or more materials covered by Table 2. This paragraph does not apply to portable tanks or cargo tanks.

(d) Any packaging having a capacity of 110 gallons or less that contains only the residue of a hazardous material covered by Table 2 of this section need not be included in determining the applicability of the placarding requirements.

(Source: 7 Ill. Reg 3486, effective April 2, 1983)

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TABLE 1

If the motor vehicle or freight container contains a material classed (described) as-	The motor vehicle or freight container must be placarded on each side and each end-
Class A explosives	EXPLOSIVES A.
Class B explosives	EXPLOSIVES B. ²
Poison A	POISON GAS.
Flammable solid (DANGEROUS WHEN WET label only).	FLAMMABLE SOLID W. ³
Radioactive material	RADIOACTIVE. ^{4,5}
Radioactive material:	
Uranium hexafluoride, fissile (containing more than 0.7 pct U235).	RADIOACTIVE ⁴ AND CORROSIVE. ⁶
Uranium hexafluoride, low specific activity (containing 0.7 pct or less U235).	RADIOACTIVE ^{4,5} AND CORROSIVE. ⁶

1 (RESERVED)

2 EXPLOSIVES B placard not required if the freight container or motor vehicle contains class A explosives and is placarded EXPLOSIVES A as required.

3 FLAMMABLE SOLID "W" placard is required only when the DANGEROUS WHEN WET label is specified in § 172.101 for a material classed as a Flammable solid.

4 Applies only to any quantity of packages bearing the RADIOACTIVE YELLOW III label. (See § 172.403).

5 See §§ 173.389(c) and 173.389(o), for full-load shipments of radioactive materials meeting the definition of low specific activity when transported pursuant to § 173.392(b).

6 CORROSIVE placard not required for shipments of less than 1,000 pounds gross weight.

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TABLE 2

If the motor vehicle or freight container contains a material classed (described) as-	The motor vehicle or freight container must be placarded on each side and each end-
Class C explosives	DANGEROUS. ^{1,9}
Blasting agents	BLASTING AGENTS. ⁹
Nonflammable gas	NONFLAMMABLE GAS. ⁸
Nonflammable gas (Chlorine).....	CHLORINE. ⁷
Nonflammable gas (Fluorine)	POISON.
Nonflammable gas (Oxygen, pressurized liquid)....	OXYGEN. ²
Flammable gas	FLAMMABLE GAS. ⁸
Combustible liquid	COMBUSTIBLE. ^{3,4}
Flammable liquid	FLAMMABLE.
Flammable solid	FLAMMABLE SOLID. ⁵
Oxidizer	OXIDIZER. ⁹
Organic peroxide	ORGANIC PEROXIDE.
Poison B	POISON.
Corrosive material	CORROSIVE. ⁶
Irritating material	DANGEROUS.

1 Applies only to a class C explosive required to be labeled with an EXPLOSIVE C label.

2 OXYGEN placards may be used to identify liquefied pressurized oxygen contained in a manner so it does not meet the definition in § 173.300 of this subchapter.

3 COMBUSTIBLE placard required only when a material classed as a combustible liquid is transported in a packaging having a rated capacity of more than 110 gallons or a cargo tank.

4 A FLAMMABLE placard may be used on a cargo tank and a portable tank during transportation by highway and water.

5 Except when offered for transportation by water, a FLAMMABLE placard may be displayed in place of a FLAMMABLE SOLID placard except when a DANGEROUS WHEN WET label is specified for the material in § 172.101. (See table 1, this section.)

6 See § 173.245(b) of this subchapter for authorized exemptions.

7 CHLORINE placard required only for a packaging having a rated capacity of more than 110 gallons; the NON-FLAMMABLE GAS placard for packagings having a rated capacity of 110 gallons or less.

8 A NON-FLAMMABLE GAS placard is not required on a motor vehicle displaying a FLAMMABLE GAS placard.

9 BLASTING AGENTS, OXIDIZER and DANGEROUS placards need not be displayed if a freight container or motor vehicle also contains Class A or Class B explosives and is placarded EXPLOSIVES A or EXPLOSIVES B as required.

(Source: 7 Ill. Reg 3486, effective April 2, 1983)

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§ 172.506 PROVIDING AND AFFIXING PLACARDS: HIGHWAY.

(a) Each person offering a motor carrier a hazardous material for transportation by highway shall provide to the motor carrier the required placards for the material being offered prior to or at the same time the material is offered for transportation, unless the carrier's motor vehicle is already placarded for the material as required by this subpart.

(b) No motor carrier may transport a hazardous material in a motor vehicle, unless the placards required for the hazardous material are affixed thereto as required by this subpart.

(Source: 17 Ill. Reg 4287, effective April 16, 1982)

§ 172.508 (RESERVED)

§ 172.510 (RESERVED)

§ 172.512 FREIGHT CONTAINER.

(a) CAPACITY OF 640 CUBIC FEET OR MORE. Each person who offers for transportation a hazardous material in a freight container having a capacity of 640 cubic feet or more shall affix to the freight container the placards specified for the material in accordance with § 172.504. However:

(1) The placarding exception in § 172.504(c) applies to freight containers transported by highway only, including freight containers transported for delivery to a consignee immediately following an air or water shipment.

(b) When hazardous materials are offered for transportation, not involving air transportation, in a freight container having a capacity of less than 640 cubic feet, the freight container need not be placarded. However, it must be labeled in accordance with Subpart E of this Part.

(Source: 17 Ill. Reg 4287, effective April 16, 1982)

§ 172.514 CARGO TANKS AND PORTABLE TANKS.

(a) Each person who offers for transportation a cargo tank or a portable tank containing a hazardous material shall affix the placards specified for the material in accordance with § 172.504(a). However, if placarded instead of labeled as provided in § 172.406(e)(4), a portable tank having a rated capacity of less than 1,000 gallons need be placarded on only two opposite sides.

(b) Each cargo tank and portable tank that is required to be placarded when it contains a hazardous material must remain placarded when it is emptied unless it is -

- (1) Reloaded with a material not subject to this subchapter; or
- (2) Sufficiently cleaned and purged of vapors to remove any potential hazard.

§ 172.516 VISIBILITY AND DISPLAY OF PLACARDS.

(a) Each placard on a motor vehicle must be readily visible from the direction it faces except from the direction of another motor vehicle to which the motor vehicle is coupled. This requirement may be met by the placards displayed on the freight containers or portable tanks loaded on a motor vehicle.

(b) The required placarding of the front of a motor vehicle may be on the front of a truck-tractor instead of or in addition to the placarding on the front of the cargo body to which a truck-tractor is attached.

(c) Each placard on a transport vehicle, cargo tank, portable tank or freight container must -

(1) Be securely attached or affixed thereto or placed in a holder thereon. (See Appendix C to this part.)

(2) Be located clear of appurtenances and devices such as ladders, pipes, doors, and tarpaulins;

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(3) So far as practicable, be located so that dirt or water is not directed to it from the wheels of the transport vehicle;

(4) Be located away from any marking (such as advertising) that could substantially reduce its effectiveness, and in any case at least 3 inches (76.0 mm.) away from such marking.

(5) Have the words or identification number (when authorized) printed on it displayed horizontally, reading from left to right;

(6) Be maintained by the carrier in a condition so that the format, legibility, color, and visibility of the placard will not be substantially reduced due to damage, deterioration, or obscurement by dirt or other matter.

(d) Recommended specifications for a placard holder are set forth in Appendix C of this part. Except for a placard holder similar to that contained in Appendix C to this part, the means used to attach a placard may not obscure any part of its surface other than the borders.

(e) A placard or placard holder may be hinged provided the required format, color, and legibility of the placard are maintained.

(Source: 7 Ill. Reg 3486, effective April 2, 1983)

§ 172.519 GENERAL SPECIFICATIONS FOR PLACARDS.

(a) A placard may be made of any plastic, metal, or other material that is equal to or better in strength and durability than the tagboard specified in paragraph (b) of this section. Also, reflective or retroreflective materials may be used on a placard providing the prescribed colors, strength and durability are maintained.

(b) A placard made of tagboard must be of material that has -

(1) A quality at least equal to that designated commercially as white tagboard;

(2) A weight of 125 pounds per ream of 24 by 36 inch sheets;

(3) The ability to pass a 60 p.s.i. Mullen test; and

(4) The ability to withstand open weather exposure for 30 days without a substantial reduction in effectiveness.

(c) A placard may contain form identification information, including the name of its maker if that information is printed in the outer 1/2-inch (12.7 mm.) border in no larger than 10-point type.

(d) The hazard class and division number prescribed for dangerous goods in the United Nations Recommendations entitled "Transport of Dangerous Goods" may be entered on each placard in the lower corner of the diamond on each placard. If a placard is used to display identification numbers as authorized by § 172.332, the class number must be entered in a numeral approximately 1 3/4 inches (45 mm.) in height (numeral height may be between 1 5/8 inches (41 mm.) and 1 3/4 inches (45 mm.)). It must be black on each placard except when on a NON-FLAMMABLE GAS, FLAMMABLE GAS, FLAMMABLE, COMBUSTIBLE or CORROSIVE placard. The class number on a NON-FLAMMABLE GAS, FLAMMABLE GAS, FLAMMABLE and COMBUSTIBLE placard may be white or black. The class number on a CORROSIVE placard must be white, and on a COMBUSTIBLE placard with a white bottom as prescribed by § 172.332(c)(4), the class number must be red or black.

(e) Surface pigmentation on a placard must meet the following requirements:

(1) Black and any color must be able to withstand, without substantial change -

(i) A 72-hour fadeometer test (for a description of equipment designed for this purpose, see ASTM G 23-69 (1975), or ASTM G 25-70); and

(ii) A 30-day exposure to open weather conditions.

(f) Except as provided in § 172.334 placards shall be as described in this section and as prescribed in Appendix B to this part.

(g) The dotted line at the outside of the 1/2-inch (12.7 mm.) white border on each placard is not part of the placard specification. However, a dotted or solid line outer border may be used when needed to indicate the full size of a placard that is part of a larger format or is on a background the color of which does not contrast with the placard color.

(Source: 7 Ill. Reg 3486, effective April 2, 1983)

§ 172.521 DANGEROUS PLACARD.

(a) Except for size and color, the DANGEROUS placard must be as follows:



(b) In addition to meeting the requirements of § 172.519, and Appendix B to this Part, the DANGEROUS placard must have a red upper and lower triangle. The placard center area and 1/2-inch (12.7 mm.) border must be white. The inscription must be black with the 1/8-inch (3.2 mm.) border marker in the white area at each end of the inscription red.

§ 172.522 EXPLOSIVES A PLACARD.

(a) Except for size and color, the EXPLOSIVES A placard must be as follows:



(b) In addition to meeting the requirements of § 172.519, and Appendix B to this Part, the EXPLOSIVES A placard must be orange with a 1/2-inch (12.7 mm.) white outer border. The symbol and print must be black.

§ 172.523 EXPLOSIVES B PLACARD.

(a) Except for size and color, the EXPLOSIVES B placard must be as follows:



(b) In addition to meeting the requirements of § 172.519, and this Part, the EXPLOSIVES B placard must be orange with a 1/2-inch (12.7 mm) white outer border. The symbol and print must be black.

(Source: 17 Ill. Reg 4287, effective April 16, 1982)

§ 172.524 BLASTING AGENTS PLACARD.

(a) Except for size and color, the BLASTING AGENTS placard must be as follows:



(b) In addition to meeting the requirements of this part, the BLASTING AGENTS placard must be orange with a 1/2-inch (12.7 mm) white outer border. The printing must be black.

(Source: 17 Ill. Reg 4287, effective April 16, 1982)

§ 172.525 (RESERVED)

§ 172.527 (RESERVED)

§ 172.528 NON-FLAMMABLE GAS PLACARD.

(a) Except for size and color, the NON-FLAMMABLE GAS placard must be as follows:



(b) In addition to meeting the requirements of § 172.519, and Appendix B to this Part, the NON-FLAMMABLE GAS placard must be green with the symbol, inscription, and 1/2-inch (12.7 mm.) border white.

§ 172.530 OXYGEN PLACARD.

(a) Except for size and color, the OXYGEN placard must be as follows:



(b) In addition to meeting the requirements of § 172.519, and Appendix B to this Part, the OXYGEN placard must be yellow with 1/2-inch (12.7 mm.) white border. The symbol and inscription must be black.

§ 172.532 FLAMMABLE GAS PLACARD.

(a) Except for size and color, the FLAMMABLE GAS placard must be as follows:



(b) In addition to meeting the requirements of § 172.519, and Appendix B to this Part, the FLAMMABLE GAS placard must be red with the symbol, inscription, and 1/2-inch (12.7 mm.) border white.

§ 172.536 CHLORINE PLACARD.

(a) Except for size, the CHLORINE placard must be as follows:



(b) In addition to meeting the requirements of § 172.519, and Appendix B to this Part, the CHLORINE placard must be a white 10-3/4 inches (273.0 mm.) square-on-point with a 1/8-inch (3.2 mm.) black solid line border 1/2-inch (12.7 mm.) in from each edge. The symbol and inscription must be black.

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§ 172.540 POISON GAS PLACARD.

(a) Except for size, the POISON GAS placard must be as follows:



(b) In addition to meeting the requirements of § 172.519, and Appendix B to this Part, the POISON GAS placard must be a white 10-3/4 inches (273.0 mm.) square-on-point with a 1/8-inch (3.2 mm.) black solid line border 1/2-inch (12.7 mm.) in from each edge. The symbol and inscription must be black.

§ 172.542 FLAMMABLE PLACARD AND MODIFICATION.

(a) Except for size and color, the FLAMMABLE placard must be as follows:



(b) In addition to meeting the requirements of § 172.519, and Appendix B to this Part the FLAMMABLE placard must be red with white symbol, inscription, and 1/2-inch (12.7 mm.) border.

(c) The word "GASOLINE" may be used in place of the word "FLAMMABLE" on the placard that is displayed on a cargo tank or portable tank being used to transport gasoline by highway. The word "GASOLINE" must be in letters of the same size and color as those in the word "FLAMMABLE."

§ 172.544 COMBUSTIBLE PLACARD AND MODIFICATION.

(a) Except for size and color, the COMBUSTIBLE placard must be as follows:



(b) In addition to meeting the requirements of § 172.519, and Appendix B to this Part, the COMBUSTIBLE placard must be red with white symbol, inscription, and 1/2-inch (12.7 mm.) border.

(c) The words "FUEL OIL" may be used in place of the word "COMBUSTIBLE" on the placard that is displayed on a cargo tank or portable tank being used to transport by highway fuel oil that is not classed as a flammable liquid. The words "FUEL OIL" must be in letters of the same size and color as those in the word "COMBUSTIBLE."

§ 172.546 FLAMMABLE SOLID PLACARD.

(a) Except for size and color, the FLAMMABLE SOLID placard must be as follows:



(b) In addition to complying with § 172.519 and Appendix B to this Part, the FLAMMABLE SOLID placard must be white with seven vertical stripes and a 1/2-inch (12.7 mm.) white border. The symbol and inscription must be black.

§ 172.548 FLAMMABLE SOLID W PLACARD.

(a) Except for size and color, the FLAMMABLE SOLID W placard must be as follows:



(b) (1) The triangle at the top of the FLAMMABLE SOLID W placard must be blue with a white symbol, otherwise, the specifications for the FLAMMABLE SOLID W placard are the same as those for the FLAMMABLE SOLID placard.

(2) The FLAMMABLE SOLID W placard may be:

- (i) A separate placard;
- (ii) On the reverse side of a placard; or
- (iii) A composite made by covering the top triangle of the FLAMMABLE SOLID placard with the blue triangle and white symbol as shown in paragraph (a) of this section.

§ 172.550 OXIDIZER PLACARD.

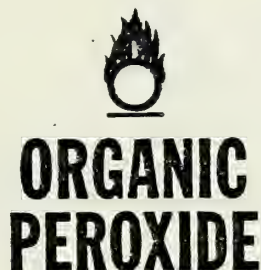
(a) Except for size and color, the OXIDIZER placard must be as follows:



(b) In addition to meeting the requirements of § 172.519, and Appendix B to this Part, the OXIDIZER placard must be yellow with a 1/2-inch (12.7 mm.) white border. The symbol and inscription must be black.

§ 172.552 ORGANIC PEROXIDE PLACARD.

(a) Except for size and color, the ORGANIC PEROXIDE placard must be as follows:



(b) In addition to meeting the requirements of § 172.519, and Appendix B to this Part, the ORGANIC PEROXIDE placard must be yellow with a 1/2-inch (12.7 mm.) white border. The symbol and inscription must be black.

§ 172.554 POISON PLACARD.

(a) Except for size, the POISON placard must be as follows:



(b) In addition to meeting the requirements of § 172.519, and Appendix B to this Part, the POISON placard must be white with a 1/8-inch (3.2 mm) black solid line border 1/2-inch (12.7 mm.) in from the edge. The symbol and inscription must be black.

§ 172.556 RADIOACTIVE PLACARD.

(a) Except for size and color, the RADIOACTIVE placard must be as follows:



(b) In addition to meeting the requirements of § 172.519, and Appendix B to this Part, the RADIOACTIVE placard must have the top portion yellow with the symbol black. The lower portion must be white and the inscription black.

§ 172.558 CORROSIVE PLACARD.

(a) Except for size, the CORROSIVE placard must be as follows:



(b) In addition to meeting the requirements of § 172.519, and Appendix B to this Part, the CORROSIVE placard must have the center and lower area black except for the letters in the word "CORROSIVE" which must be white. The symbol must be black and white.

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PART 173 GENERAL REQUIREMENTS FOR SHIPMENTS AND PACKAGINGS

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- 173.21 Forbidden materials and packages.
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- 173.50 An explosive.
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- 173.53 Definition of CLASS A explosives.
- 173.54 Ammunition for cannon.
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- 173.57 Rocket ammunition.
- 173.58 (Reserved)
- 173.59 Chemical ammunition, explosive.
- 173.60 Black powder and low explosives.
- 173.61 High explosives.
- 173.62 High explosives, liquid.
- 173.63 High explosive with liquid explosive ingredient.
- 173.64 High explosives with no liquid explosive ingredient and propellant explosives, CLASS A.
- 173.65 High explosives with no liquid explosive ingredient nor any chlorate.
- 173.66 Blasting caps, blasting caps with safety fuse, blasting caps with metal clad mild detonating fuse, and electric blasting caps.
- 173.67 Blasting caps with safety fuse and blasting caps with metal clad mild detonating fuse.
- 173.68 Detonating primers.
- 173.69 Detonating fuzes, CLASS A, with or without radioactive components, detonating fuze parts containing an explosive, boosters, bursters, or supplementary charges.
- 173.70 Diazodinitrophenol or lead mononitroresorcinate.
- 173.71 Fulminate of mercury.
- 173.72 Guanyl nitrosamino guanylidene hydrazine.
- 173.73 Lead azide.
- 173.74 Lead styphnate.
- 173.75 Nitro mannite.
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- 173.78 Tetrazene.

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Sec.

- 173.79 Jet thrust units (jato), CLASS A explosives; rocket motors, CLASS A explosives; igniters, jet thrust (jato), CLASS A explosives; and igniters, rocket motor, CLASS A explosives.
- 173.80 Charged oil well jet perforating guns.
- 173.81-173.85 (Reserved)
- 173.86 New explosives, definitions; approval and notification.
- 173.87 Explosives in mixed packing.

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- 173.88 Definition of CLASS B explosives.
- 173.89 Ammunition for cannon with empty projectiles, inert-loaded projectiles, solid projectiles, or without projectiles or shell.
- 173.90 Rocket ammunition with empty, inert-loaded, or solid projectiles.
- 173.91 Special fireworks.
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- 173.93 Propellant explosives (solid) for cannon, rockets, guided missiles, or other devices, and propellant explosives (liquid).
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- 173.100 Definition of CLASS C explosives.
- 173.101 (Reserved)
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- 173.102 Explosive cable cutters; explosive power devices, CLASS C; explosive release devices, or starter cartridges, jet engine, CLASS C explosives.

Sec.

- 173.103 Blasting caps, blasting caps with safety fuse, blasting caps with metal clad mild detonating fuse, and electric blasting caps, not exceeding 1,000 caps.
- 173.104 Cordeau detonant fuse, mild detonating fuse, metal clad or flexible linear shaped charges, metal clad.
- 173.105 Percussion, tracer, combination, time fuses and tracers.
- 173.106 Cartridge bags, empty, with black powder igniters, igniters, safety squibs, electric squibs, delay electric igniters, igniter fuse-metal clad, and fuse lighters or fuse igniters.
- 173.107 Primers and grenades, empty, primed.
- 173.108 Common fireworks, signal flares, hand signal devices, smoke signals, smoke candles, smoke grenades, smoke pots, and Very signal cartridges.
- 173.109 Toy caps.
- 173.110 Charged oil well jet perforating guns, total explosive content in guns not exceeding 20 pounds per motor vehicle.
- 173.111 Cigarette loads, explosive auto alarms, toy propellant devices, toy smoke devices, trick matches, and trick noise makers, explosive.
- 173.112 Oil well cartridges.
- 173.113 Detonating fuses, CLASS C explosives.
- 173.114 Actuating cartridges, explosive, fire extinguisher or valve.
- 173.114a Blasting agents.

Subpart D-Flammable, Combustible, and Pyrophoric Liquids; Definitions and Preparation

- 173.115 Flammable, combustible, and pyrophoric liquids; definitions.
- 173.116 Outage.
- 173.117 Closing and cushioning.
- 173.118 Limited quantities of flammable liquids.
- 173.118a Exceptions for combustible liquids.
- 173.119 Flammable liquids not specifically provided for.
- 173.120 Automobiles, motorcycles, tractors, or other self-propelled vehicles.
- 173.121 Carbon bisulfide (disulfide).
- 173.122 Acrolein, inhibited.
- 173.123 Ethyl chloride.
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Sec.		Subpart E-Flammable Solids, Oxidizers, and Organic Peroxides; Definitions and Preparation
173.125	Alcohol, n.o.s. (flammable liquid).	
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173.127	Nitrocellulose or collodion cotton fibrous, or nitrostarch, wet; nitrocellulose flakes; colloided nitrocellulose, granular, flake, or block, and lacquer base or lacquer chips, wet.	Sec.
173.128	Paints and related materials (flammable liquids).	173.150 Flammable solid; definition.
173.129	Polishes (flammable liquids).	173.151 Oxidizer; definition.
173.130	Refrigerating machines.	173.151a Organic peroxide; definition.
173.131	Road asphalt, or tar, liquid.	173.152 Packing.
173.132	Cement liquid, n.o.s.; container cement; linoleum cement; pyroxylin cement; rubber cement; tile cement; wallboard cement; coating solution (flammable liquids).	173.153 Limited quantities of flammable solids, oxidizers and organic peroxides.
173.133	Spirits of nitroglycerin.	173.154 Flammable solids, organic peroxide solids and oxidizers not specifically provided for.
173.134	Pyrophoric liquids, n.o.s.	173.154a Fusees.
173.135	Diethyl dichlorosilane, dimethyl dichlorosilane, ethyl dichlorosilane ethyl trichlorosilane, methyl trichlorosilane, trimethyl chlorosilane, and vinyl trichlorosilane.	173.155 Bags, nitrate of soda, empty and unwashed.
173.136	Methyl dichlorosilane and trichlorosilane.	173.156 Barium peroxide and calcium peroxide.
173.137	Lithium aluminum hydride, ethereal.	173.157 Benzoyl peroxide, chlorobenzoyl peroxide (para), cyclohexanone peroxide, dimethylhexane dihydroperoxide, lauroyl peroxide, or succinic acid peroxide, wet.
173.138	Pentaborane.	173.158 Benzoyl peroxide, dry; chlorobenzoyl peroxide (para) dry; cyclohexanone peroxide, dry; lauroyl peroxide, dry; or succinic acid peroxide, dry.
173.139	Ethylene imine, inhibited, and propylene imine, inhibited.	173.159 Burnt cotton.
173.140	Zirconium, metallic, solutions, or mixtures thereof, liquid.	173.160 Calcium chlorite and sodium chlorite.
173.141	Amyl mercaptan, butyl mercaptan, ethyl mercaptan, isopropyl mercaptan, propyl mercaptan, and aliphatic mercaptan mixtures.	173.161 Calcium phosphide.
173.142	(Reserved)	173.162 Charcoal.
173.143	Methylchloromethyl ether, anhydrous.	173.163 Chlorate of soda, chlorate of potash, and other chlorates.
173.144	Ink (flammable liquid).	173.164 Chromic acid or chromic acid mixture, dry.
173.145	Dimethylhydrazine, unsymmetrical and methylhydrazine.	173.165 Coal, ground bituminous; sea coal; coal facings.
173.146	Heaters for refrigerator cars, flammable liquid fuel type.	173.166 Cobalt resinate, precipitated; calcium resinate, and calcium resinate fused.
173.147	Methyl vinyl ketone, inhibited.	173.167 Cotton waste, oily.
173.148	Monoethylamine.	173.168 Lithium amide, powdered.
173.149	Methyl magnesium bromide in ethyl ether in concentrations not over 40 percent.	173.169 Fiber, burnt.
173.149a	Nitromethane.	173.170 Fibers of fabrics impregnated, saturated or coated.
		173.171 Fish scrap or fish meal.
		173.172 Hair, wet.
		173.173 Aluminum dross or magnesium dross.
		173.174 Iron sponge, spent oxide, spent iron mass, spent iron sponge.
		173.175 Lacquer base, or lacquer chips, dry.
		173.176 Matches.

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173.177	Motion-picture film and X-ray film.	173.209	Tankage, garbage, and tankage fertilizers.
173.178	Calcium carbide.	173.210	Tankages, rough ammoniate.
173.179	N-Methyl-N'-Nitro-N-Nitrosoguanidine	173.211	Textile waste, wet.
173.180-173.181	(Reserved)	173.212	Trinitrobenzene and trinitrotoluene, wet.
173.182	Nitrates.	173.213	Wool waste, wet.
173.183	Potassium nitrate mixed (fused) with sodium nitrite.	173.214	Hafnium metal or zirconium metal, wet, minimum 25 percent water by weight, mechanically produced, finer than 270 mesh particle size; hafnium metal or zirconium metal, dry, in an atmosphere of inert gas, mechanically produced, finer than 270 mesh particle size; hafnium metal or zirconium metal, wet, minimum 25 percent water by weight, chemically produced (See Note 1), finer than 20 mesh particle size; hafnium metal or zirconium metal, dry, in an atmosphere of inert gas, chemically produced (See Note 1), finer than 20 mesh particle size.
173.184	Nitrocellulose or collodion cotton, wet, or nitrocellulose, colloided, granular, or flake, wet; nitrostarch, wet, or nitroguanidine, wet.	173.215	(Reserved)
173.185	Paper stock, wet.	173.216	Zirconium picramate, wet.
173.186	Paper waste, wet.	173.217	Calcium hypochlorite, hydrated; Calcium hypochlorite mixture dry; lithium hypochlorite mixture dry; mono-(trichloro) tetra-(monopotassium dichloro)-penta-s-triazinetriene, dry; potassium dichloro-s-triazinetriene, dry; sodium dichloro-s-triazinetriene, dry; trichloro-s-triazinetriene, dry.
173.187	Peroxide of sodium.	173.218	Isopropyl percarbonate, unstabilized.
173.188	Phosphoric, anhydrous.	173.219	Potassium perchlorate.
173.189	Phosphorus, amorphous, red.	173.220	Magnesium or zirconium scrap consisting of borings, clippings, shavings, sheets, turnings, or scalplings, and magnesium metallic (other than scrap), powdered, pellets, turnings, or ribbon.
173.190	Phosphorus, white or yellow.	173.221	Liquid organic peroxides, n.o.s., and liquid organic peroxide solutions, n.o.s.
173.191	Phosphorus pentachloride.	173.222	Acetyl peroxide and acetyl benzoyl peroxide, solution.
173.192	Picrate of ammonia (ammonium picrate), picric acid, trinitrobenzoic acid, and urea nitrate wet.	173.223	Peracetic acid.
173.193	Picric acid, trinitrobenzoic acid, or urea nitrate, wet.	173.224	Cumene hydroperoxide, dicumyl peroxide, diisopropylbenzene hydroperoxide, paramethane hydroperoxide, and tertiary butylisopropyl benzene hydroperoxide.
173.194	Potassium permanganate.	173.225	Phosphorus trisulfide, phosphorus sesquisulfide, phosphorus heptasulfide, and phosphorus pentasulfide.
173.195	Pyroxylin plastic scrap.	173.226	Thorium metal, powdered.
173.196-173.197	(Reserved)	172.227	Urea peroxide.
173.197a	Smokeless powder for small arms.	173.228	Zinc ammonium nitrite.
173.198	Sodium hydride.		
173.199	Rags, oily.		
173.200	Rags, wet.		
173.201	Rubber scrap, rubber buffings, reclaimed rubber, or regenerated rubber.		
173.202	Sodium metal liquid alloy, potassium metal liquid alloy, and sodium potassium liquid alloy.		
173.203	Tetranitromethane.		
173.204	Sodium hydrosulfite.		
173.205	Sodium picramate, wet.		
173.206	Sodium or potassium, metallic; sodium amide; sodium potassium alloys; sodium aluminum hydride; lithium metal; lithium silicon; lithium ferro silicon; lithium hydride; lithium borohydride; lithium aluminum hydride; lithium acetylde-ethylene diamine complex; aluminum hydride; cesium metal; rubidium metal; zirconium hydride, powdered.		
173.207	Sulfide of sodium or sulfide of potassium, fused or concentrated, when ground.		
173.208	Titanium metal powder, wet or dry.		

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- 173.229 Chlorate and borate mixtures or chlorate and magnesium chloride mixtures.
- 173.230 Sodium, metallic, dispersion in organic solvent.
- 173.231 Calcium, metallic, crystalline.
- 173.232 Aluminum, metallic powder.
- 173.233 Nickel catalyst, finely divided, activated or spent.
- 173.234 Sodium nitrite and sodium nitrite mixtures.
- 173.235 Ammonium bichromate (ammonium dichromate).
- 173.236 Decaborane.
- 173.237 Chlorine dioxide hydrate, frozen; chloric acid.
- 173.238 Aircraft rocket engines (commercial) and/or aircraft rocket engine igniters (commercial).
- 173.239 Barium azide-50 percent or more water wet.
- 173.239a Ammonium perchlorate.

Subpart F-Corrosive Materials; Definition and Preparation

- 173.240 Corrosive material; definition.
- 173.241 Outage.
- 173.242 Bottles containing corrosive liquids.
- 173.243 Closing and cushioning.
- 173.244 Limited quantities of corrosive materials.
- 173.245 Corrosive liquids not specifically provided for.
- 173.245a Corrosive liquids n.o.s. shipped in bulk.
- 173.245b Corrosive solids not specifically provided for.
- 173.246 Antimony pentafluoride, bromide pentafluoride, iodine pentafluoride, bromine trifluoride, and chlorine trifluoride.
- 173.247 Acetyl bromide, acetyl chloride, acetyl iodide, antimony pentachloride, benzoyl chloride, boron trifluoride-acetic acid complex, chromyl chloride, dichloroacetyl chloride, diphenylmethyl bromide solution, pyro sulfuryl chloride, silicon chloride, sulfur chloride (mono and di), sulfuryl chloride,

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- thionyl chloride, tin tetrachloride (anhydrous), titanium tetrachloride, and trimethyl acetic chloride.
- 173.247a Vanadium tetrachloride and vanadium oxytrichloride.
- 173.248 Acid sludge, sludge acid, spent sulfuric acid, or spent mixed acid.
- 173.249 Alkaline corrosive liquids, n.o.s.; Alkaline liquids, n.o.s.; Alkaline corrosive battery fluid; Potassium fluoride solution; Potassium hydrogen fluoride solution; Sodium aluminate, liquid; Sodium hydroxide solution; Potassium hydroxide solution; Boiler compound, liquid, solution.
- 173.249a Cleaning compound, liquid; Coal tar dye, liquid; Dye intermediate, liquid; Mining reagent, liquid; and Textile treating compound mixture, liquid.
- 173.250 Automobiles, other self-propelled vehicles, engines or other mechanical apparatus.
- 173.250a Benzene phosphorus dichloride and benzene phosphorus thiodichloride.
- 173.251 Boron trichloride and boron tribromide.
- 173.252 Bromine.
- 173.253 Chloroacetyl chloride.
- 173.254 Chlorosulfonic acid and mixtures of chlorosulfonic acid-sulfur trioxide.
- 173.255 Dimethyl sulfate.
- 173.256 Compounds, cleaning, liquid.
- 173.257 Electrolyte (acid) and alkaline corrosive battery fluid.
- 173.258 Electrolyte, acid, or alkaline corrosive battery fluid, packed with storage batteries.
- 173.259 Electrolyte, acid, or alkaline corrosive battery fluid, packed with battery charger, radio current supply device, or electronic equipment and actuating devices.
- 173.260 Electric storage batteries, wet.
- 173.261 Fire-extinguisher charges.
- 173.262 Hydrobromic acid.
- 173.263 Hydrochloric (muriatic) acid, hydrochloric (muriatic) acid mixtures, hydrochloric (muriatic) acid solution, inhibited; sodium chlorite solution (not exceeding 42 percent sodium chlorite); and cleaning compounds, liquids, containing hydrochloric (muriatic) acid.
- 173.264 Hydrofluoric acid; White acid.
- 173.265 Hydrofluosilicic acid.

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173.266 Hydrogen peroxide solution in water.

173.267 Mixed acid (nitric and sulfuric acid) (nitrating acid).

173.268 Nitric acid.

173.269 Perchloric acid.

173.270 Phosphorus tribromide.

173.271 Phosphorus oxybromide, phosphorus oxychloride, phosphorus trichloride, and thiophosphoryl chloride.

173.272 Sulfuric acid.

173.273 Sulfur trioxide, stabilized.

173.274 Fluosulfonic acid.

173.275 Difluorophosphoric acid, anhydrous; monofluorophosphoric acid, anhydrous, hexafluorophosphoric acid, and mixtures thereof.

173.276 Anhydrous hydrazine and hydrazine solution.

173.277 Hypochlorite solutions.

173.278 Nitrohydrochloric acid.

173.279 Anisoyl chloride.

173.280 Trichlorosilanes.

173.281 Benzyl bromide (bromotoluene, alpha).

173.282 Isopropyl percarbonate, stabilized.

173.283 Fluoboric acid.

173.284 Tungsten hexafluoride.

173.285 (Reserved)

173.286 Chemical kits.

173.287 Chromic acid solution.

173.288 Chloroformates.

173.289 Formic acid and formic acid solutions.

173.290 Mixtures of hydrofluoric and sulfuric acid.

173.291 Flame retardant compound, liquid.

173.292 Hexamethylene diamine solution.

173.293 Iodine monochloride.

173.294 Monochloroacetic acid, liquid or solution.

173.295 Benzyl chloride.

173.296 Di isooctyl acid phosphate.

173.297 Titanium sulfate solution containing not more than 45 percent sulfuric acid.

173.298 Menthyltetrahydro phthalic anhydride.

173.299 Etching acid liquid, n.o.s.

173.299a Tris-(1-aziridinyl) phosphine oxide.

Subpart G-Compressed Gases; Definition and Preparation

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173.300 Definitions.

173.300a (Reserved)

173.300b (Reserved)

173.300c (Reserved)

173.301 General requirements for shipment of compressed gases in cylinders.

173.302 Charging of cylinders with non-liquefied compressed gases.

173.303 Charging of cylinders with compressed gas in solution (acetylene).

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173.305 Charging of cylinders with a mixture of compressed gas and other material.

173.306 Limited quantities of compressed gases.

173.307 Exceptions for compressed gases.

173.308 Cigarette lighter or other similar device charged with fuel.

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173.314 Requirements for compressed gases in tank car tanks.

173.315 Compressed gases in cargo tanks and portable tank containers.

173.316 Liquefied hydrogen.

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Subpart H-Poisonous Materials, Etiologic Agents, and Radioactive Materials; Definitions and Preparation

173.325 Classes of poisonous materials.

173.326 Poison A.

173.327 General packaging requirements for Poison A materials.

173.328 Poison A materials not specifically provided for.

173.329 Bromacetone; chloropicrin and methyl chloride mixtures; chloropicrin and nonflammable, nonliquefied compressed gas mixtures.

173.330 Chemical ammunition.

173.331 Gas identification sets.

173.332 Hydrocyanic acid, liquid (prussic acid) and hydrocyanic acid liquefied.

173.333 Phosgene or diphosgene.

173.334 Organic phosphates mixed with compressed gas.

173.335 (Reserved)

173.336 Nitrogen dioxide, liquid; nitrogen peroxide, liquid; and nitrogen tetroxide, liquid.

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173.337	Nitric oxide.	173.365	Poison B solids not specifically provided for.
173.338-173.342	(Reserved)	173.366	Arsenic (arsenic trioxide) or arsenic acid (solid)
173.343	Poison B.	173.367	Arsenical compounds, n.o.s.; arsenate of lead; calcium arsenate; Paris green; and arsenical mixtures.
173.344	General packaging requirements for Poison B liquids.	173.368	Arsenical dust, arsenical flue dust, and other poisonous noncombustible by-product dusts; also arsenic trioxide, calcium arsenate, and sodium arsenate.
173.345	Limited quantities of Poison B liquids.	173.369	Carbolic acid (phenol), not liquid.
173.346	Poison B liquids not specifically provided for.	173.370	Cyanides and cyanide mixtures, dry.
173.347	Aniline oil.	173.371	Dinitrobenzol (dinitrobenzene).
173.348	Arsenic acid.	173.372	Mercury bichloride (mercuric chloride).
173.349	Carbolic acid (phenol) liquid.	173.373	Ortho-nitroaniline and para-nitroaniline.
173.350	Chemical ammunition.	173.374	Nitrochlorbenzene, meta or para.
173.351	Hydrocyanic acid solutions.	173.375	Sodium azide.
173.352	Sodium and potassium cyanide solutions, and cyanide solutions, n.o.s.	173.376	Aldrin and aldrin mixtures, dry, with more than 65 percent aldrin.
173.353	Methyl bromide and methyl bromide mixtures.	173.377	Hexaethyl tetraphosphate mixtures; methyl parathion mixtures; organic phosphorus compound mixtures; organic phosphate compound mixtures; parathion mixtures; tetraethyl dithio pyrophosphate mixtures; and tetraethyl pyrophosphate mixtures, dry.
173.353a	Methyl bromide, liquid and nonflammable, nonliquefied compressed gas mixtures.	173.378	(Reserved)
173.354	Motor fuel antiknock compound or tetraethyl lead.	173.379	Cyanogen bromide.
173.355	Phenyldichlorarsine.	173.380	(Reserved)
173.356	Thiophosgene.	173.381	Irritating materials; Definition and general packaging requirements.
173.357	Chloropicrin and chloropicrin mixtures containing no compressed gas or Poison A liquid.	173.382	Irritating materials, not specifically provided for.
173.358	Hexaethyl tetraphosphate; methyl parathion; organic phosphate compound; organic phosphorus compound; parathion; tetraethyl dithio pyrophosphate; and tetraethyl pyrophosphate, liquid.	173.383	Chemical ammunition.
173.359	Hexaethyl tetraphosphate mixtures; methyl parathion mixtures; organic phosphorus compound mixtures, organic phosphate compound mixtures; parathion mixtures; tetraethyl dithio pyrophosphate mixtures; and tetraethyl pyrophosphate mixtures, liquid (includes solutions, emulsions, or emulsifiable liquids).	173.384	Monochloracetone, stabilized.
173.360	Perchloro-methyl-mercaptan.	173.385	Tear gas grenades, tear gas candles, or similar devices.
173.361	Aldrin mixtures, liquid, with more than 60 percent aldrin.	173.386	Etiologic agents; definition and scope.
173.362	4-Chloro-o-toluidine hydrochloride.	173.387	Packaging requirements for etiologic agents.
173.362a	Dinitrophenol solutions.	173.388	Labeling of packages containing etiologic agents.
173.363	General packaging requirements for Poison B solids.	173.389	Radioactive materials; definitions.
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Sec.	Subpart J-Other Regulated Material; Definition and Preparation
173.393 General packaging and shipment requirements.	
173.393a U.S. Atomic Energy Commission approved packages; standard requirements and conditions.	Sec. 173.500 Definitions.
173.393b International shipments and foreign-made packages; standard requirements and conditions.	173.505 (Reserved)
173.394 Radioactive material in special form.	173.510 General Packaging Requirements
173.395 Radioactive material in normal form.	
173.396 Fissile radioactive material.	Subpart K-(Reserved)
173.397 Contamination control.	Subpart L-(Reserved)
173.398 Special tests.	Subpart M-(Reserved)
173.399 (Reserved)	Subpart N-Other Regulated Material; ORM-D
	173.1200 Consumer Commodity.
Subpart I-(Reserved)	Subpart O-Other Regulated Material; ORM-E
	173.1300 Hazardous Waste, Liquid or Solid, N.O.S.; Hazardous Substance, Liquid or Solid, N.O.S.
	Appendix A-Method of testing corrosion to skin.

Authority: Illinois Revised Statutes, Chapter 95 1/2, Paragraphs 700-4(a) and 700-9(a).

(Source: 7 Ill. Reg 3486, effective April 2, 1983)

SUBPART A-GENERAL

§ 173.1 PURPOSE AND SCOPE.

(a) This Part defines hazardous materials for transportation purposes and prescribes certain requirements to be observed in preparing them for shipment by highway.

(b) A shipment that is not prepared for shipment in accordance with this subchapter may not be offered for transportation. It is the duty of each person who offers hazardous materials for transportation to instruct each of that person's officers, agents and employees having any responsibility for preparing hazardous materials for shipment as to applicable regulations in this subchapter.

(c) When a person other than the person preparing a hazardous material for shipment performs a function required by this Part, that person shall perform the function in accordance with this Part.

(Source: 17 Ill. Reg 4287, effective April 16, 1982)

ILLINOIS HAZARDOUS MATERIALS TRANSPORTATION REGULATIONS

§ 173.2 CLASSIFICATION OF A MATERIAL HAVING MORE THAN ONE HAZARD AS DEFINED IN THIS PART.

(a) Except as provided in paragraph (b) of this section, a hazardous material, having more than one hazard as defined in this Part must be classed according to the following order of hazards:

- | | |
|----------------------------------|---|
| (1) Radioactive material. | (10) Corrosive material (solid). |
| (2) Poison A. | (11) Irritating materials. |
| (3) Flammable gas. | (12) Combustible liquid (in containers having capacities exceeding 110 gallons). |
| (4) Non-flammable gas. | (13) ORM-B. |
| (5) Flammable liquid. | (14) ORM-A. |
| (6) Oxidizer. | (15) Combustible liquid (in containers having capacities of 110 gallons or less). |
| (7) Flammable solid. | (16) ORM-E |
| (8) Corrosive material (liquid). | |
| (9) Poison B. | |

(b) Exceptions. Paragraph (a) of this section does not apply to -

- (1) A material specifically identified in § 172.101 of this subchapter;
- (2) An explosive required to be classed and approved under § 173.86, or a blasting agent required to be classed and approved under § 173.114a.
- (3) An etiologic agent identified in § 173.386 as those materials listed by the U.S. Department of Health, Education and Welfare in 42 CFR § 72.25(c); or
- (4) An organic peroxide. (See §§ 172.101 and 173.151a of this subchapter.)

(Source: 7 Ill. Reg 3486, effective April 2, 1983)

§ 173.3 PACKAGING AND EXCEPTIONS.

(a) The packaging of hazardous materials for transportation by highway must be as specified in this Part. Methods of manufacture, packing, and storage of hazardous materials, that affect safety in transportation, must be open to inspection by a duly authorized representative of the initial carrier.

(b) The regulations setting forth packaging requirements for a specific material apply to highway transportation unless otherwise stated or unless exceptions from packaging requirements are authorized.

(Source: 7 Ill. Reg 3486, effective April 2, 1983)

§ 173.4-173.6 (RESERVED)

§ 173.7 U.S. GOVERNMENT MATERIAL.

(a) Shipments of hazardous materials offered by or consigned to the Department of Defense (DOD) of the U.S. Government must be packaged, including limitations of weight, in accordance with the regulations in this subchapter or in containers of equal or greater strength and efficiency as required by DOD regulations.

(1) Hazardous materials sold by the DOD in packagings that are not marked in accordance with the requirements of this subchapter may be shipped from DOD installations if the DOD certifies in writing that the packagings are equal to or greater in strength and efficiency than the packaging prescribed in this subchapter. The shipper shall obtain such a certification in duplicate for each shipment. He shall give one copy to the originating carrier and retain the other for no less than 1 year.

(b) Shipments of radioactive materials, made by or under the direction or supervision of the U.S. Energy Research and Development Administration or the Department of Defense, and which are escorted by personnel specifically designated by or under the authority of those agencies, for the purpose of national security, are not subject to the regulations of this subchapter.

ILLINOIS HAZARDOUS MATERIALS TRANSPORTATION REGULATIONS

§ 173.8 CANADIAN SHIPMENTS AND PACKAGINGS.

(a) Except for hazardous wastes and hazardous substances, shipments of hazardous materials which conform to the regulations of the Canadian Transport Commission (formerly the Board of Transport Commissioners for Canada), may be transported from the point of entry in Illinois to their destination in Illinois or through Illinois en route to a point of entry in Canada.

(b) Except as specified in § 173.301(i) specification packagings made and maintained in full compliance with the corresponding specifications prescribed by the Railway Transport Committee of the Canadian Transport Commission (formerly the Board of Transport Commissioners for Canada) in its regulations for the Transportation of Dangerous Commodities by Rail, and marked in accordance therewith (e.g., BTC, CTC, etc.) may be used for the shipment of hazardous materials within Illinois.

(Source: 7 Ill. Reg 3486, effective April 2, 1983)

§ 173.9-173.11 (RESERVED)

SUBPART B-PREPARATION OF HAZARDOUS MATERIALS FOR TRANSPORTATION

§ 173.21 FORBIDDEN MATERIALS AND PACKAGES.

Unless otherwise provided in this subchapter, the offering for transportation of the following is forbidden:

(a) A hazardous material in the same packaging, freight container, or overpack with another hazardous material, the mixing of which would be liable to cause a dangerous evolution of heat or gas, or produce corrosive materials, except as provided in §§ 173.152(a) and 173.242(a) and (b).

(b) A package containing a material which is liable to decompose or polymerize at a temperature of 130°F. (54.4°C.) or less with an evolution of a dangerous quantity of heat or gas unless stabilized or inhibited in a manner that will preclude such evolution.

(1) The determination of whether a material is forbidden under this paragraph may be made by one of the following methods: Standard Method of Test for Constant Temperature Stability of Chemical Materials (ASTM E-487-74) or the Self Accelerating Decomposition Temperature (SADT) Test published by the Organic Peroxide Producers' Safety Division (OPPSD).

(2) Refrigeration may be used as a means of stabilization only when approved by the Associate Director for Operations and Enforcement, MTB. (For status of approvals issued by the Bureau of Explosives, see § 171.19 of this subchapter.)

(3) For organic peroxides, the decomposition temperature of 130°F.(54.4°C.) does not apply in the controlled temperature requirements specified in Chapter 11 of the UN Recommendations are applied to determine when refrigeration is required.

(c) Packages which evolve a dangerous quantity of flammable gas or vapor released from a material which would not otherwise be subject to this subchapter, i.e., the release of flammable vapor or gas in such quantities that a flammable mixture with air would be created within a transport vehicle.

(d) Packages containing materials (other than those classed as explosives) which will detonate in a fire. For the purposes of this paragraph, a detonation is a type of explosion in which a shock wave travels through the material at a speed greater than the speed of sound in the undecomposed material. When tests are required to evaluate a package under the provisions of this paragraph, the testing must be done or approved by one of the agencies specified in § 173.86.

(e) Any package containing a cigarette lighter or other similar device with fuel and equipped with an ignition element, unless the design of the device and its packaging insofar as they affect safety in transportation have been examined by the Bureau of Explosives (B of E) and approved by the Associate Director for Operations and Enforcement, MTB. (An approval which was issued by the B of E remains valid to the same extent as if it had been issued by MTB.) For lighters containing gases, also see § 173.308.

(Source: 7 Ill. Reg 3486, effective April 2, 1983)

§ 173.22 SHIPPER'S RESPONSIBILITY.

(a) Unless otherwise provided in this part, before offering a hazardous material for shipment in a container the shipper shall determine that the container has been made, assembled with all parts or fittings in their proper place and properly secured, and marked in compliance with applicable specifications prescribed in Parts 178 and 179 of this subchapter or with specifications of the Department in effect at date of manufacture of container. In determining whether a specification container is manufactured in accordance with applicable specifications, the shipper may accept the manufacturer's certification or specification marking. (See §§ 178.0-2 and 179.1 of this subchapter.) For containers supplied by the carrier, the shipper may rely on the manufacturer's identification plate, specification marking, or on certification by the carrier. When a shipper performs a function covered by or having an effect on a specification requirement of Part 178 or Part 179, the shipper must perform that function in accordance with the specification.

(b) Prior to each shipment of fissile radioactive materials, and Type B or large quantities of radioactive materials, the shipper shall notify the consignee of the dates of shipment and of expected arrival. The shipper shall also notify each consignee of any special loading/unloading instructions prior to his first shipment.

(Source: 17 Ill. Reg 4287, effective April 16, 1982)

§ 173.22a USE OF PACKAGINGS AUTHORIZED UNDER EXEMPTIONS.

(a) Except as provided in paragraph (b) of this section, no person may offer a hazardous material for transportation in a packaging the use of which is dependent upon an exemption issued under Subpart B of Part 107 of this title, unless that person is the holder of or a party to the exemption.

(b) If an exemption authorizes the use of a packaging for the shipment or transportation of a hazardous material by any person or class of persons other than or in addition to the holder of the exemption, that person or a member of that class of persons may use the packaging for the purposes authorized in the exemption subject to the terms specified therein. However, no person may use a packaging under the authority of this paragraph unless he maintains a copy of the exemption at each facility where the packaging is being used in connection with the shipment or transportation of the hazardous material concerned. Copies of federal exemptions may be obtained from the Office of Hazardous Materials Regulation, U.S. Department of Transportation, Washington, D.C. 20590, Attention: Docket Section.

(Source: 17 Ill. Reg 4287, effective April 16, 1982)

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ILLINOIS HAZARDOUS MATERIALS TRANSPORTATION REGULATIONS

§ 173.23 PREVIOUSLY AUTHORIZED PACKAGING.

(a) Where the regulations require specs. 6D or 37M (§§ 178.102 or 178.134 of this subchapter) cylindrical steel overpacks, specs. 5B, 6J, or 37A (single-trip container) (§§ 178.82, 178.100, or 178.131 of this subchapter) metal drums manufactured before March 18, 1964, having inside specs. 2S, 2SL, 2T, or 2TL (§§ 178.21, 178.27, 178.35, or 178.35a of this subchapter) polyethylene container, may be continued in use for the commodities and gross weights for which they were previously authorized.

(b) Reusable molded polyethylene containers for use without overpack complying with spec. 34 (§ 178.19 of this subchapter), manufactured before September 5, 1966, may be continued in use, if they are plainly marked "ICC-34," and are embossed with the maker's name or symbol, rated capacity, and the month and year of manufacture.

§ 173.24 STANDARD REQUIREMENTS FOR ALL PACKAGES.

(a) Each package used for shipping hazardous materials under this subchapter shall be so designed and constructed, and its contents so limited, that under conditions normally incident to transportation -

(1) There will be no significant release of the hazardous materials to the environment;

(2) The effectiveness of the packaging will not be substantially reduced; and

(3) There will be no mixture of gases or vapors in the package which could, through any credible spontaneous increase of heat or pressure, or through an explosion, significantly reduce the effectiveness of the packaging.

(b) Materials for which detailed specifications for packaging are not set forth in this part must be securely packaged in strong, tight packages meeting the requirements of this section.

(c) Packaging used for the shipment of hazardous materials under this subchapter shall, unless otherwise specified or exempted therein, meet all of the following design and construction criteria:

(1) Each specification container must be marked as follows:

(i) In an unobstructed area with letters and numerals identifying the container specification (e.g., DOT-1A, DOT-17E-304HT, DOT-23G40). See § 178.0-2 of this subchapter.

(ii) The name and address or symbol of person making the mark specified in paragraph (c)(1)(i) of this section. Symbol letters, if used, must be registered with the MTB-TSC. Duplicate symbols are not authorized.

(iii) The markings must be stamped, embossed, burned, printed, or otherwise marked on the packaging to provide adequate accessibility, permanency, and contrast so as to be readily apparent and understood.

(iv) Unless otherwise specified, letters and numerals must be at least 1/2-inch high.

(v) Packaging which does not comply with the applicable specification listed in this subchapter must not be marked to indicate such compliance (see §§ 178.0-2 and 179 of this subchapter).

(vi) The markings in this section are not required for a surface moisture/density gauge transported as Radioactive Material, Special Form, N.O.S., when accompanied by a shipping paper which contains (or is accompanied by) a signed statement or certification from the manufacturer of the gauge attesting that the gauge construction complies with all applicable package specifications except those that pertain to marking.

(2) Steel used shall be low-carbon, commercial quality steel. Stainless, open hearth, electric, basic oxygen, or other similar quality steels are acceptable. Steel sheets of specified gauges shall comply with the following:

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Gauge No.	Nominal thickness (inches)	Minimum thickness (inches)
12 -----	0.1046	0.0946
13 -----	0.0897	0.0817
14 -----	0.0747	0.0677
15 -----	0.0673	0.0603
16 -----	0.0598	0.0533
17 -----	0.0538	0.0478
18 -----	0.0478	0.0428
19 -----	0.0418	0.0378
20 -----	0.0359	0.0324
22 -----	0.0299	0.0269
23 -----	0.0269	0.0239
24 -----	0.0239	0.0209
26 -----	0.0179	0.0159
28 -----	0.0149	0.0129
30 -----	0.0120	0.0110

(3) Lumber used shall be well seasoned, commercially dry, and free from decay, loose knots, knots that would interfere with nailing, and other defects that would materially lessen the strength.

(4) Welding and brazing shall be performed in a workmanlike manner using suitable and appropriate techniques, materials, and equipment.

(5) Packaging materials and contents shall be such that there will be no significant chemical or galvanic reaction among any of the materials in the package.

(6) Closures shall be adequate to prevent inadvertent leakage of the contents under normal conditions incident to transportation. Gasketed closures shall be fitted with gaskets of efficient material which will not be deteriorated by the contents of the container.

(7) Nails, staples, and other metallic devices shall not protrude into the interior of the outer packaging in such a manner as to be likely to cause failures.

(8) The nature and thickness of the packaging shall be such that friction during transport does not generate any heating likely to decrease the chemical stability of the contents.

(9) Polyethylene used must be of a type compatible with the lading and must not be permeable to an extent that a hazardous condition could be caused during transportation and handling.

(d) For specification containers, compliance with the applicable specifications in Parts 178 and 179 of this subchapter shall be required in all details, except as otherwise provided in this subchapter.

(Source: 6 Ill. Reg 10036, effective August 2, 1982)

§ 173.25 AUTHORIZED PACKAGES IN OUTSIDE CONTAINERS.

(a) Authorized packages containing no corrosive liquids may be shipped when tightly packed in a strong outside fiberboard box or drum, wooden box, barrel or crate, metal barrel or drum, or overpack, meeting the requirements of §§ 173.21 and 173.24. The outside container must be marked with the proper shipping name and labeled as required by this subchapter for each hazardous material contained therein unless markings and labels representative of each material in the outside container are visible. Packages required by the regulations in this subchapter

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to be marked "THIS SIDE UP" or "THIS END UP" must be packed in the outside container with their filling holes up and the outside container marked "THIS SIDE UP" or "THIS END UP" to indicate the upward position of closures. The outside container must also be marked "INSIDE PACKAGES COMPLY WITH PRESCRIBED SPECIFICATIONS" when specification packagings are required unless the specification markings on the inside packaging are visible.

(b) Authorized packages containing acids or other corrosive liquids except nitric acid, perchloric acid, or hydrogen peroxide, solution containing over 52 percent hydrogen peroxide by weight, may be shipped when tightly packed in strong outside fiberboard or wooden box, wooden crate or overpack, meeting the requirements of §§ 173.21 and 173.24 provided such outside container shall not contain any other hazardous material except under the following conditions:

(1) As provided in §§ 173.242, 173.257, 173.258, 173.259, 173.260, 173.261, and 173.286.

(2) Electrolyte acid or alkaline corrosive battery fluid in packages prescribed in §§ 173.257 and 173.258 may be included in outside shipping containers with dry charged storage batteries when packed to prevent movement within the outside containers.

(3) The outside container must be marked with the proper shipping name and labeled as required by this subchapter for each hazardous material contained within unless the markings and labels representative of each material in the outside container are visible. The outside container must be marked "THIS SIDE UP" or "THIS END UP" to indicate the upward position of closures and also marked "INSIDE PACKAGES COMPLY WITH PRESCRIBED SPECIFICATIONS" when specification packagings are required unless the specification markings on the inside packagings are visible.

§ 173.26 QUANTITY LIMITATIONS AND METRIC MEASUREMENTS.

(a) When quantity limitations are specified in this subchapter only by U.S. liquid measure for 110 gallons or less, or only by avoirdupois weight for 1,000 pounds or less, quantities measured in metric units may be substituted on an equivalent basis and up to and including one liter per quart and 500 grams per pound. When metric measurements are used, specification packagings must be marked to indicate their use and must be tested accordingly. Symbols for metric markings are L for liter, mL for milliliter, kg for kilogram, and g for gram.

(b) When quantity limitations do not appear in the packaging requirements of this subchapter, the permitted gross weight or capacity authorized for a container to be offered for transportation is as shown in the container specification.

(Source: 17 Ill. Reg 4287, effective April 16, 1982)

§ 173.27 (RESERVED)

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§ 173.28 REUSE OF CONTAINERS.

(a) Containers used more than once (refilled and reshipped after having been previously emptied) must be in such condition, including closure devices and cushioning materials, that they comply in all respects with the prescribed requirements for those containers. Repairs must be made in an efficient manner in accordance with requirements for materials and construction as prescribed in this subchapter for new containers, or as otherwise prescribed. Parts that are weak, broken, or otherwise deteriorated must be replaced.

(1) Retest of carboy packages must have been made by or for shippers, or their authorized agents, as required by applicable provisions of the specifications in Part 179 of this subchapter before carboys which are to be offered for transportation are filled.

NOTE 1: Tests not required by shipper who fills and ships or who reships filled carboys for one shipment only carboy packages which have been properly tested by another shipper or a duly authorized agency.

(b) Markings applied as prescribed by the specifications must be maintained in a legible condition.

(c) If, on account of painting or any other reason the markings as prescribed for any container cannot be kept plain and legible, a metal plate, brazed or soldered, or otherwise securely fastened to the container, with a reproduction of the prescribed markings plainly stamped thereon, will be permitted.

(d) Containers previously used for the shipment of any hazardous material must have the old markings, including name of contents, addresses, and labels, if any, thoroughly removed or obliterated before being used for the shipment of other articles.

(e) Boxes previously used for high explosives containing a liquid explosive ingredient not contained in an inside metal container must not be again used for shipments of any character.

(1) Boxes that have been contaminated by liquid explosive composition must not again be used for shipments of any character.

(f) Kegs previously used for any chlorate must not be again used for shipments of any character.

(g) Metal kegs previously used for black powder not contained in an interior package must not be again used for shipment of any explosive.

NOTE 1: Because of the present emergency and until further order of the Department, metal kegs, previously used for the shipment of black powder not contained in an interior package, may be used provided the kegs are in good physical condition and are not liable to permit escape of contents during transportation. Empty kegs previously used for shipment of black powder must be entirely free of black powder on the inside and outside before being offered for transportation.

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(h) Except as provided in paragraphs (m), (n), and (p) of this section, single-trip containers (marked STC) and nonreusable containers (marked NRC) subject to the specification requirement of Part 178 of this subchapter from which contents have been removed following use for transportation of any material, may not be used thereafter for the transportation of hazardous materials.

(i) (Reserved)

(j) (Reserved)

(k) Containers used for shipments of etching acid liquid, n.o.s. must not be reused for shipment of any commodity.

(l) Cylinders used in anhydrous hydrofluoric acid service must comply with the requirements of § 173.264 (b) (1) and must not be used in any other service.

(m) Specs. 17C, 17E, and 17H steel drums (§§ 178.115, 178.116, 178.118 of this subchapter) from which contents have been removed, may be reused as prescribed in this Part as packagings for shipment of flammable liquids, flammable solids, organic peroxides, oxidizers, poisons covered by § 173.370, radioactive materials, and corrosive liquids covered by §§ 173.249 and 173.249a, only if the following requirements, in addition to the other requirements of this section, are complied with prior to each reuse:

(1) Each drum must be thoroughly cleaned to remove all residues and foreign matter, inspected for deterioration or defects, and returned to its original shape and contour. All closure devices and parts must be removed (if removable), inspected for defects, and replaced as necessary. Each open head cover gasket must be replaced. Any drum which shows evidence of deterioration (e.g., visible pitting; creases; significant reduction in parent metal thickness from rust, corrosion, or cleaning processes; metal fatigue; or other material defects) or which cannot be returned to its original shape and contour does not qualify for reuse.

(2) The entire surface of each drum, except for the removable head and adjacent chime area of open-head drums, must be tested for leakage by constant internal air pressure. The leakage test must be conducted by submersion under water, by completely covering the surface with soap suds or oil, or by some other method that will be equally sensitive. The air pressure must be maintained for a period of time sufficient to permit a complete inspection for leaks. The minimum air pressure for the test must be as follows:

Specification No.	Capacity	Minimum test pressure p.s.i.
17C -----	All -----	15
17E -----	Over 12 gallons -----	7
	12 gallons or less -----	5
17H -----	Over 12 gallons -----	7
	12 gallons or less -----	5

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If leaking, the drum does not qualify for reuse.

(3) Marking:

(i) All previous test markings, commodity identification markings, and labels must be removed.

(ii) The outside of each drum qualifying for reuse under this section must be marked on the body within 10 inches of the top head with the following information: "Tested" (or "Inspected" as appropriate), the month and year of the test (or inspection, if an open-head drum) and the U.S. DOT registration number of the reconditioner. For example:

TESTED 2/70
DOT R1001

The registration number required for this marking must be obtained from the Office of Hazardous Materials, U.S. Department of Transportation, Washington, D.C. 20590.

(iii) Markings must be in at least 1/4-inch figures and letters on a contrasting background.

(iv) The printed marking of the month and year of test is not required if each is clearly indicated by other means, such as perforations on a decal.

(n) A packaging marked as STC or NRC according to the specification requirements of Part 178 of this subchapter may be reused for the shipment of any corrosive solid, ORM-A, ORM-B, ORM-C, ORM-E, or any material not required by this subchapter to be shipped in a DOT specification packaging. Paragraph (m) of this section does not apply to these materials.

(o) Any drum meeting one specification which has been altered to meet another specification must be capable of meeting the new specification in all respects.

(1) Each drum so altered must be inspected, tested, and marked in accordance with paragraph (m) of this section. In addition, the drum must - (i) Bear the specification markings required by the specification under which it was originally manufactured, and

(ii) Bear both the old and the new specification identification in conjunction with the markings required by paragraph (m) of this section with the specification to which the drum is converted shown last, e.g., "17E/17H". For example:

17E/17H
TESTED 2/70
DOT R1001

(p) A packaging marked NRC or STC according to the specification requirements of Part 178 of this subchapter may be reused for the shipment of hazardous waste to designated facilities subject to the following conditions:

(1) Except as authorized by this paragraph, the waste must be packaged in accordance with this Part and offered for transportation in accordance with the requirements of this subchapter.

(2) Transportation is performed by highway only.

(3) A package is not offered for transportation less than 24 hours after it is finally closed for transportation, and each package is inspected for leakage immediately prior to being offered for transportation.

(4) Each package is loaded by the shipper and unloaded by the consignee, unless the motor carrier is a private or contract carrier.

(5) The packaging may be used only once under this paragraph and may not be used again for shipment of hazardous materials except in accordance with paragraph (m) or (n) of this section.

(Source: 7 Ill. Reg 3486, effective April 2, 1983)

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§ 173.29 EMPTY PACKAGINGS, PORTABLE TANKS, CARGO TANKS, AND TANK CAR TANKS

(a) Except as otherwise provided in this section, a packaging having a capacity of 110 gallons or less that previously contained a hazardous material may not be offered for transportation unless offered in the same manner as required when it previously contained a greater quantity of hazardous materials.

(1) This paragraph does not apply to-

- (i) A packaging that has been cleaned and purged of all residue, or
- (ii) A packaging filled with a material that is not subject to this subchapter.

(2) The word "waste" does not have to be displayed as part of the marking required by § 172.300 of this subchapter on a packaging having a capacity of 110 gallons or less that contains only the residue of a hazardous material.

(3) Any packaging having a capacity of 110 gallons or less that contains only the residue of a hazardous material covered by Table 2 of § 172.504 of this subchapter-

(i) Does not have to be included in determining the applicability of the placarding requirements of that section, and

(ii) Is not subject to the shipping paper requirements of this subchapter when collected and transported by a contract or private carrier for reconditioning or reuse.

(b) Any packaging or accessory which has been used for a shipment of radioactive materials and which contains residual internal radioactive contamination, when shipped as empty, must be securely closed. The external surface must be free of significant removable radioactive contamination as provided in § 173.397(a). The radiation at the external surface of the packaging must not exceed 0.5 millirem per hour. The "Empty" label, described in § 172.450 of this subchapter, must be affixed to the packaging.

(c) An empty portable tank, cargo tank, or tank car tank may not be offered for transportation unless-

(1) Each opening is tightly closed.

(2) Except as otherwise specified in this subchapter it is offered for transportation in the same manner as when it previously contained a greater quantity of a hazardous material. This requirement, as well as other provisions in this subchapter, does not apply to any tank that has been cleaned or purged of all hazardous materials residue or when it is reloaded with a material not subject to this subchapter.

(d) An empty packaging bearing a label or marking that is described in this subchapter and that pertains to the identification of a hazardous material may not be offered for transportation, unless the packaging contains some of the hazardous material that previously required display of the label or marking. This prohibition does not apply to transportation in a transport vehicle or freight container if such a packaging is not visible during transportation and the packaging is loaded by the shipper and unloaded by the shipper or consignee.

(Source: 7 Ill. Reg 3486, effective April 2, 1983)

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§ 173.30 LOADING AND UNLOADING OF TRANSPORT VEHICLES.

A person who loads or unloads hazardous materials into or from a transport vehicle shall comply with the applicable loading and unloading requirements of Part 177 of this subchapter.

§ 173.31 QUALIFICATION, MAINTENANCE, AND USE OF TANK CAR TANKS.

(a) General qualifications for use.

(1) Except as otherwise provided in subparagraph (2) of this paragraph, every tank car tank used for the transportation of hazardous materials shall meet the requirements of the applicable specification and regulations for the transportation of the particular commodity. See subparagraph (3) of this paragraph.

(2) In addition, to the tanks authorized in Part 173, tanks built prior to July 1, 1927 in compliance with the American Railway Association's Specifications for Tank Cars or tanks built in compliance with previous specifications of the U.S. Department of Transportation, if built or under construction on the effective dates thereof are authorized for service as prescribed in the following table and notes, provided tanks and safety relief devices are retested as prescribed in paragraphs (c) and (d) of this section and equipped with approved valves, valve protection devices and safety relief devices.

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Specifications prescribed in current regulations	Other specifications permitted (subject to the notes)	Notes
106A500-X _____ 106A800-X _____	ICC-27, 8E-27, 106A500 _____ 106A800 _____	_____ _____

(3) Unless otherwise specifically provided in Part 173, when class DOT-106A or 110AW tank car tanks are prescribed, the same class tanks having higher marked test pressures than those prescribed may also be used.

(b) Loading and shipping - (1) Examination before shipping. When tanks are loaded and prior to shipping, the shipper must determine to the extent practicable, that the tank, safety appurtenances and fittings are in proper condition for the safe transportation of the lading. Tanks with bottom discharge outlets must have their outlet caps off, or outlet cap plugs open, during the entire time tanks are being loaded. After loading, tanks with bottom outlet valves which permit more than a dropping of the liquid with the outlet caps off, or the outlet cap plugs open, must not be offered for transportation until proper repairs have been made. Tanks which show any dropping or leaking of liquid contents at seams or rivets, must not be offered for transportation until proper repairs have been made.

(2) Loading requirements for tanks with interior heater coils. Tank cars equipped with interior heater coils, except when coils are rendered inoperative by blocking off the inlet and outlet, must be loaded with heater coil inlet and outlet caps off during entire time tanks are being loaded and show no leakage with caps off.

(3) Securing closures. All closures of openings in tank cars and of their protective housings must be properly secured in place by the use of a bar, wrench, or other suitable tool. A wrench having a handle at least 36 inches long must be used to apply the outlet valve cap. Manway covers and outlet valve caps must be made tight against leakage of vapor and liquid, by use of gaskets of suitable materials, before cars are tendered to carrier for transportation. Luting materials must not be used in outlet cap or on threads of bottom outlet.

(4) Inspection of safety relief devices on class DOT-106A and 110A tanks. Safety relief devices of the frangible disc or fusible plug type used on tanks of classes DOT-106A or 110A must be inspected before each loaded trip of tank by removing at least one vent for visual inspection; if it shows signs of deterioration, all devices must be removed and inspected and those which do not meet the requirements must be renewed.

(c) (Reserved)

(d) Periodic retest and reinspection of tanks other than single-unit tank car tanks.

(1) Tanks designed to be removed from cars for filling and emptying and their safety relief devices must be retested periodically as specified in Retest Table 2 of this paragraph. Retests may be made at any time during the calendar year the retest falls due.

(2) Each tank except as provided in subparagraph (d) (9) of this section must be subjected to the specified hydrostatic pressure and its permanent expansion determined. Pressure must be maintained for 30 seconds and as much longer as may be necessary to secure complete expansion of the tank. Pressure gauge must permit reading to an accuracy of 1 percent. Expansion gauge must permit reading of total expansion to an accuracy of 1 percent. Expansion must be recorded in cubic centimeters. Permanent volumetric expansion must not exceed 10 percent or total volumetric expansion at test pressure and tank must not leak or show evidence of distress.

(3) Each tank must also be subjected to interior air pressure test of at least 100 psi under conditions favorable to detection of any leakage. No leaks shall appear.

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(4) Safety relief valves must be retested by air or gas, must start to discharge at or below the prescribed pressure and must be vaportight at or above the prescribed pressure.

(5) Frangible discs or fusible plugs must be removed from the tank and visually inspected.

(6) Tanks must be retested as specified in Retest Table 2 of this paragraph before return to service after repairs involving welding or heat treatment.

(7) The month and year of test, followed by a "V" if visually inspected as described in subparagraph (d) (9) of this section, must be plainly and permanently stamped into the metal of one head or chime of each tank passing test; for example, 1-60 for January 1960. Date of previous tests and all prescribed markings must be kept legible.

(8) Retests of tanks and safety relief devices must be reported by party making tests to owner of tank. Reports must show registered identifying mark and serial number, pressure to which tested, date and place of test, and by whom tested. Reports of latest retest must be retained by owner until the next retest has been accomplished and recorded.

(9) Tanks of DOT 106A and DOT 110A-W (§§ 179.300, 179.301, 179.302 of this subchapter) specifications used exclusively for transporting fluorinated hydrocarbons and mixtures thereof which are free from corroding components may be given a periodic complete internal and external visual inspection in lieu of the periodic hydrostatic retest. Visual inspections shall be made only by competent persons. Acceptance or rejection of tanks must be based upon the methods used for cylinders in CGA Pamphlet C-6, and the results must be recorded on a suitable data sheet, the completed copies of which must be kept by the owner as a permanent record. The points to be recorded and checked on these data sheets are: Date of inspection (month and year followed by a "V" to indicate visual inspection); DOT specification number; tank identification (registered symbol and serial number, date of manufacture and ownership symbol); type of protective coating (painted, etc., and statement as to need of refinishing or recoating); conditions checked (leakage, corrosion, gouges, dents or digs, broken or damaged chime of protective ring, fire, fire damage, internal condition); disposition of tank (returned to service, returned to manufacturer for repair, or scrapped).

RETEST TABLE 2

Specification	Retest interval-years		Retest pressure-psi		Safety relief valve pressure-psi	
	Tank	Safety relief devices	Tank hydro-static expansion*	Tank air test	Start-to-discharge	Vapor tight
DOT 27 -----	5	2	500	100	375	300
106A500 -----	5	2	500	100	375	300
106A500X -----	5	2	500	100	375	300
106A800 -----	5	2	800	100	600	480
106A800X -----	5	2	800	100	600	480
106A800NCI ----	5	2	800	100	600	480
110A500W -----	5	2	500	100	375	300
110A800-W -----	5	2	800	100	600	480
110A1000-W ----	5	2	1,000	100	750	600

*See 173.31 (d) (9).

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(e) Tank car tanks subjected to the action of fire.

(1) Tank car tanks of other than classes DOT 106A or 110A bearing evidence of damage to the metal by fire must be withdrawn from transportation service except that if the damage to the tank is local only or confined to not more than 25 percent of the tank surface, the damaged material may be replaced. See paragraph (f) (1) of this section for the procedure for handling tank car tanks with more than 25 percent of the tank surface damaged.

(2) Tank car tanks of classes DOT 106A or 110A bearing evidence of damage to the metal by fire must be withdrawn from transportation service until they have been inspected inside and outside to determine that no reduction in wall thickness has resulted, and have been heat-treated and retested. These operations must be carried out, supervised and reported as prescribed by the specifications for original heat treatment and test.

(f) Repairs or alterations.

(1) For procedure to be followed in making repairs or alterations to all tank car tanks and securing approval therefor, see Appendix R., Association of American Railroads Specifications for Tank Cars.

(2) After alterations of tank cars or equipment therefor from original design, a certificate of compliance with the respective specification must be furnished to the car owner, to the Bureau of Explosives, and to the Secretary, Mechanical Division, Association of American Railroads.

§ 173.32 QUALIFICATION MAINTENANCE, AND USE OF PORTABLE TANKS.

(a) Except as otherwise provided in this section, every portable tank container used for the transportation of dangerous articles shall fulfill the requirements of the specification and regulations for the transportation of the particular commodity. A manufacturer's data report of the portable tank container shall be procured and retained in the files of the owner during the time that such portable tank container is used for such service.

(1) When a portable tank container is used as a cargo tank container, it shall comply with all the requirements prescribed for cargo tank containers. (See § 173.33).

(2) (Reserved)

(3) Each uninsulated portable tank used for the transportation of compressed gases, as defined in § 173.300, must have an exterior surface finish complying with § 178.245-1 (c) of this subchapter.

(b) Any portable tank container constructed prior to May 15, 1950, complying with the requirements of either the A.S.M.E. Code for Unfired Pressure Vessels, 1946 Edition, or the A.P.I.-A.S.M.E. Code for Unfired Pressure Vessels, 1943 Edition, may be used for the transportation of liquified compressed gas, provided it fulfills all the requirements of this Part and specifications for the particular gas or gases to be transported therein and shall be marked "ICC Specification 51X" on the plate required by the specification, except as modified by any or all of the following:

(1) Tanks designed and constructed in accordance with Pars. U-68, U-69, or U-201 of the A.S.M.E. Code may be used. Tanks designed and constructed in accordance with Pars. U-68 or U-69 may be re-rated at a working pressure 25 percent in excess of the design pressure for which the tank was originally constructed. If advantage is taken of the increased rating, the re-rated pressure shall be marked on the plate as follows:

Re-rated working pressure -- psig.

NOTE 1: For purposes of setting safety relief valves, pressure control valves and establishing retest pressure, and for purposes of establishing maximum and minimum design pressures, the re-rated working pressure shall be considered as the equivalent of the design pressure as defined in the specification.

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(2) Loading and unloading accessories, valves, piping, fittings, safety and gauging devices, do not have to comply with the requirements for the particular location on the tank.

(3) Tanks having capacities of between 750 pounds and 1,000 pounds of water shall be considered as portable tank containers for the purposes of this part. In lieu of using safety relief valves on such containers they may be equipped with fusible plugs only when the container is filled by weight. Size, number, and location, as well as character and physical properties of fusible plugs shall be approved by the U.S. Department of Transportation. These containers shall be marked "ICC Specification 51S".

(4) Specification requirements as to stress-relieving and radiographing are waived.

(c) Any portable tank container of ICC Specification 50¹ fulfilling the requirements of that specification may be continued in service for transportation of a liquefied petroleum gas if it is retested every five years in accordance with the requirements of paragraph (e) (3), (4), and (5) of this section: PROVIDED, that it is in and can be maintained in safe operating condition for the transportation of that gas. In this case the container may retain its original markings.

(d) USE OF SPECIFICATION 52 AND 53 TANKS. Continued use of an existing portable tank constructed to specs. 52 or 53 is authorized only for a tank constructed before June 1, 1972.

(e) RETEST. Each portable tank used for the transportation of a hazardous material must be successfully retested before further use in accordance with the following:

(1) SCHEDULE. Each tank must be retested as prescribed in subparagraph (2) of this paragraph, in accordance with the following schedule:

(i) Spec. 51 (§ 178.245 of this subchapter): at least once every 5 years.

(ii) Specs. 52, 53, 56, and 57 (§§ 178.251, 178.252, 178.253 of this subchapter): At least once every two years.

(iii) Spec. 60 (§ 178.255 of this subchapter): At the end of the first 4-year period after the original test; at least once every 2 years thereafter up to a total of 12 years of service; and at least once annually thereafter. Retesting is not required on a rubber-lined tank except before each relining.

(iv) Any other portable tank authorized by this part for transportation of compressed gases (including liquefied compressed gases): At least once every 5 years.

(2) TEST PROCEDURES. Unless otherwise specified, each tank must be retested in accordance with the following test procedures:

(i) PRESSURE. Each spec. 60 tank must be retested in accordance with § 178.255-12 of this subchapter. A spec. 57 tank must be retested in accordance with § 178.253-5 (b) of this subchapter. Any other tank must be tested by a minimum pressure (air or hydrostatic) of at least 2 pounds per square inch gage or at least one and one-half times the design pressure (maximum allowable working pressure, or re-rated pressure) of the tank, whichever is greater. During each air pressure test, the entire surface of all joints under pressure must be coated with or immersed in a solution of soap and water, heavy oil, or other material suitable for the purpose of detecting leaks. The pressure must be held for a period of time sufficiently long to assure detection of leaks. During the air or hydrostatic test, relief devices may be removed, but all the closure fittings must be in place and the relief devices openings plugged. Lagging need not be removed from a lagged tank if it is possible to maintain the required test pressure at constant temperature with the tank disconnected from the source of pressure.

(ii) VISUAL. While under the test pressure, the tank must be visually inspected for leakage, defective fittings and welds, defective closures, significant dents, and other defects or abnormalities which indicate a potential or actual weakness that could render the tank unsafe for the transportation of a hazardous material.

(iii) REJECTION CRITERIA. A tank fails to meet the requirements of the pressure test if, during the test, there is permanent distortion of the tank exceeding that permitted by the applicable specification, if there is any leakage, or if any deficiencies described in

¹ Use of existing portable tanks authorized, but new construction not authorized.

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subdivision (ii) of this subparagraph are found. Any tank that fails must be rejected and may not be used again for the transportation of a hazardous material unless the tank is adequately repaired and thereafter a successful test is conducted in accordance with the requirements of this paragraph.

(3) MARKING. The date of the most recent periodic retest must be marked on the tank, on or near the metal certification plate. Marking must be in accordance with § 173.24.

(4) RECORDS. The owner of the tank or his authorized agent must retain a written record indicating the date and results of all required tests and the name and address of the tester, until the next retest has been satisfactorily completed and recorded.

(f) SPECIAL TANKS. Each portable tank authorized by this Part including each special permit tank (other than a tank covered by paragraph (e) (1) (iv) of this section) which is not in compliance with one of the specifications listed in paragraph (e) of this section, must be tested in accordance with the procedures prescribed in paragraph (e) of this section for the type of portable tank most nearly equivalent in design and usage. A tank constructed in accordance with paragraph U-68 or U-69 of previous editions of the ASME Code, and which has not been re-rated, must be hydrostatically retested at twice the design pressure instead of the one and one-half times prescribed in paragraph (e) (2) (i) of this section.

(g) DETERIORATED TANKS. Without regard to any other retest requirements, any tank that shows evidence at any time of bad dents, corroded areas, leakage, or other conditions that indicate weakness which could render the tank unsafe for the transportation of a hazardous material, must be retested as prescribed in paragraph (e) (2) of this section.

(h) DAMAGED TANKS. Any tank that has been in an accident and that has been damaged to an extent that may adversely affect its product retention capability, must be retested as prescribed in paragraph (e) (2) of this section.

(i) UNUSED TANKS. Any tank that has not been used to transport a hazardous material for a period of 1 year or more may not be returned to hazardous materials service until it has been tested successfully in accordance with the requirements of paragraph (e) (2) of this section.

(j) The Department may require the testing under prescribed conditions of any tank when probable cause appears for suspecting that such tank is in unsafe operating condition.

(k) The repair of tanks is authorized, provided such repairs are made under requirements prescribed in the "Code" for the original design and construction.

(1) In addition to any other provisions of the specification, no tank shall be repaired, or remodeled, as to cause leakage or cracks or likelihood of leakage or cracks, by areas of stress concentration due to shrinkage of cooling metal in welding operations, sharp fillets, reversal of stresses, or otherwise.

(2) No field welding shall be done except to non-pressure parts.

(1) The bursting strength of any piping and fittings shall be not less than four times the design pressure of the tank, and not less than four times that pressure to which, in any instance, it may be subjected in service, by the action of a pump or other device (not including safety relief valves) the action of which may be to subject certain portions of the tank piping to pressures greater than the design pressure of the tank.

(1) Welded pipe joints shall be used wherever possible. Joints in copper tubing where permitted shall be of the brazed type or of any equally strong metal union type. Melting point of brazing material must be not less than 1,000° F. Such joints shall in any event be of such a character as not to decrease the strength of the tubing, as by the cutting of threads.

(2) Fittings shall be extra heavy. Non-malleable metals shall not be employed in the construction of valves or fittings.

(3) Suitable provision shall be made in every case to allow for expansion, contraction, jarring and vibration of all pipe. Slip joints shall not be used for this purpose.

(4) Piping and fittings shall be grouped in the smallest practicable space and shall be protected from damage as required by the specification.

(5) All piping, valves and fittings on every tank shall be leakage tested with gas or air after installation and proved tight at not less than the design pressure of the tank on which they are used. In the event of replacement, all such piping, valves, or fittings so replaced

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shall be tested in accordance with the requirements of this section before the tank is returned to transportation service. The requirements of this section shall apply with equal force to all hose used on such tanks, except that such hose may be so tested either before or after installation on the tank.

(m) All materials of construction used in portable tank containers and their appurtenances shall not be subject to destructive attack by the contents of the tank.

(1) All parts of tanks and appurtenances for anhydrous ammonia shall be steel. No copper, silver, zinc, nor their alloys shall be permitted. Brazed joints shall not be permitted.

(n) Each outlet of portable tanks used for the transportation of liquefied compressed gases, except carbon dioxide, shall be provided with a suitable automatic excess-flow valve. These valves shall be located inside the tank or at a point outside the tank where the line enters or leaves the tank. The valve seat shall be located inside the tank or shall be located within a welded flange or its companion flange, or within a nozzle or within a coupling. The installation shall be made in such a manner as reasonably to assure that any undue strain which causes failure requiring functioning of the valve shall cause failure in such a manner that it will not impair the operation of the valve.

EXCEPTION. Safety device connections and liquid level gauging devices which are so constructed that the outward flow of tank contents shall not exceed that passed by a No. 54 drill size opening are not required to be equipped with excess-flow valves.

(1) Excess-flow valves shall close automatically at the rated flows of gas or liquid as specified by the valve manufacturer. The connections or lines on each side of the excess-flow valve, including valves, fittings, etc., shall have a greater capacity than the rated flow of the excess-flow valve.

(2) Excess-flow valves may be designed with a by-pass, not to exceed a No. 60 drill size opening, to allow equalization of pressures.

(3) Filling and discharge lines shall be provided with manually operated shut-off valves located as close to the tank as is practicable. The use of so-called "Stop-Check" valves to satisfy with one valve the requirements of this subparagraph and of paragraph (n) of this section, is forbidden.

(o) Each tank for carbon dioxide and nitrous oxide shall be lagged with a suitable insulation material of such thickness that the overall thermal conductance is not more than 0.08 Btu per square foot per degree F. differential in temperature per hour. The conductance shall be determined at 60° F. Insulation material used on tanks for nitrous oxide shall be noncombustible.

(p) A refrigerating and/or heating coil or coils may be installed in tanks for carbon dioxide and nitrous oxide. Such coils must be tested externally to at least the same pressure as the test pressure of the tank. The coils must also be tested internally to at least twice the working pressure of the heating or refrigerating system to be used but in no case less than the test pressure of the tank. Such coils shall be securely anchored. The refrigerant or heating medium to be circulated through the coil or coils must be such as to cause no adverse chemical reaction with the tank or tank contents in case of leakage.

§ 173.33 QUALIFICATION, MAINTENANCE AND USE OF CARGO TANKS.

(a) General: Unless otherwise provided in this Part every cargo tank (or compartment) used for the transportation of hazardous materials must be an authorized container. Such authorized container shall comply with requirements as set forth in this section in addition to those regulations applicable for the transportation of the particular commodity.

(b) Container authorization: Cargo tank qualification as an authorized container includes compliance with applicable specs. MC 300, MC 301, MC 302, MC 303, MC 304, MC 305, MC 306, MC 307, MC 310, MC 311, MC 312, MC 330, or MC 331 plus current compliance with the retest provisions as required in § 177.824 of this subchapter and marked accordingly.

(1) Cargo tanks constructed on or after December 1, 1967 must be constructed in compliance with specs. MC 306, MC 307, MC 312 or MC 331 (§§ 178.341, 178.342, 178.343 or 178.337 of this subchapter).

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(2) Continued use of existing cargo tanks constructed to specs. MC 300 (§ 178.321), MC 302 (§ 178.323), MC 303 (§ 178.324), MC 304 (§ 178.325), MC 305 (§ 178.326), MC 310 (§ 178.330), and MC 311 (§ 178.331) is authorized but new construction may not commence after September 1, 1967.

(3) Continued use of existing cargo tanks constructed to spec. MC 301 (§ 178.322) is authorized but new construction is not permitted after June 11, 1961.

(4) Continued use of existing cargo tanks constructed to spec. MC 330 (§ 178.336) is authorized but new construction is not permitted after May 14, 1967.

(5) Non-specification cargo tanks of less than 4100 gallons capacity which were constructed prior to February 1, 1979 may continue to be used until January 1, 1985 for the transportation of flammable liquids, providing such tanks meet all the requirements of the Illinois State Fire Marshal regulations for tank trucks and tank wagons, as specified in "Gasoline and Volatile Oils: The Law, Rules and Regulations Relating to the Storage, Transportation, Sale and Use of Gasoline and Volatile Oils, and the Law Prescribing the Color and Label for Gasoline or Benzol Receptacles," amended June, 1968, and providing that such tanks are inspected and maintained in accordance with § 177.824 and marked accordingly. The first such inspection shall be completed by September 1, 1980.

(c) Multipurpose cargo tanks: Multipurpose cargo tanks which have more than one compartment, each of which meets the requirements qualifying them as different container types, are authorized for use for applicable commodities.

(1) Multipurpose tanks which can be physically altered to qualify as containers to accommodate various commodities subject to the regulations in this Part or commodities not subject to the regulation in this Part are authorized if:

(i) All applicable provisions of the regulations in this Part which are required to qualify the container as acceptable for the commodity being transported are met.

(ii) The required physical alterations to convert from one container type to another are clearly indicated on or near the certification plate.

(d) A spec. MC 330 (§ 178.336) or MC 331 (§ 178.337 of this subchapter) cargo tank must not be used unless it has successfully met the following requirements, as applicable:

(1) Each cargo tank must be tested and inspected at least once every 5 years in accordance with subparagraphs (d)(2), (3), (4), (10), (11), and (12) of this section. A cargo tank that has been in service more than 5 years since the last test or retest, must be tested and inspected according to the provision of this paragraph. The tank and each safety relief valve of any cargo tank used for the transportation of chlorine must be retested at least once every 2 years.

(2) The tank less any fittings must be subjected to a hydrostatic or pneumatic pressure of one and one-half times the design pressure (maximum allowable working pressure or rated pressure) of the tank. For pneumatic testing, the test procedure specified in § 177.824(d)(3) of this subchapter shall be followed. When a pneumatic test is performed, suitable safeguards should be provided to protect employees and other persons should a failure occur.

(3) The tank shall be inspected for corroded areas, bad dents, or other conditions, including leakage under test pressure, which indicate weakness that might render the tank unsafe for transportation service, and shall be rejected if evidence of any such unsafe condition is discovered.

(4) The tank lagging, if any, and its jacket need not be removed from lagged tanks unless it is found to be impossible to reach test pressure and maintain a condition of pressure equilibrium after test pressure is reached during tank retesting.

(5) Every cargo tank which shall have been authorized by the Department to transport hazardous materials under the provisions of paragraph (b) of this section shall be tested under requirements specifically set forth in the terms of such authorization.

(6) Without regard to any other retest requirement, and any tank that shows evidence at any time of bad dents, corroded areas, leakage, or other conditions that indicate weakness which might render the tank unsafe for transportation service, shall be retested as prescribed by subparagraphs (2), (3), and (4) of this paragraph.

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(7) Any tank which has been in an accident and which has been damaged to an extent likely to cause it to be in unsafe condition or to an extent where such a condition is suspected, shall be tested as prescribed by subparagraphs (2), (3), and (4) of this paragraph.

(8) Any tank which has been out of transportation service for a period of 1 year or more shall not be returned to or placed in such service until it shall have successfully fulfilled the testing requirements prescribed by subparagraphs (2), (3), and (4) of this paragraph.

(9) The Department may require the testing under prescribed conditions of any tank when probable cause appears for suspecting that such tank is in unsafe condition.

(10) AMMONIA TANKS. Each MC 330 and MC 331 cargo tank used for anhydrous ammonia which is constructed of quenched and tempered steel or constructed of other than quenched and tempered steel but without post-weld heat treatment, must be internally inspected by the wet fluorescent magnetic particle method immediately prior to and in conjunction with the performance of any hydrostatic retest prescribed in this section. The wet fluorescent magnetic particle inspection must be in accordance with Section V of the ASME Code and CGA Technical Bulletin TB-2 titled, "Guidelines for Inspection and Repair of MC 330 and MC 331 Cargo Tanks," 1975 edition. This paragraph does not apply to cargo tanks that do not have manholes.

(11) REPAIRS. All cracks and other defects found must be repaired in accordance with the repair procedures described in CGA Technical Bulletin TB-2, titled, "Guidelines for Inspection and Repair of MC 330 and MC 331 Cargo Tanks," 1975 edition and Section VIII of the edition of the ASME Code under which the tank was built. Each tank having cracks and defects requiring welded repairs must meet all of the requirements of § 178.337-16 of this subchapter except that post-weld heat treatment after minor weld repairs is not required. When any repairs are made, including those by grinding, the tank must again be examined by the wet fluorescent magnetic particle method after hydrotest to assure that all defects have been removed.

(12) REPORTS REQUIRED. Each motor carrier operating a MC 330 or MC 331 cargo tank subject to subparagraph (d) (10) of this section shall make a written report, in duplicate, concerning the cargo tank following the required inspection or test. This reporting requirement does not apply to a motor carrier leasing a cargo tank for less than 30 days if the lessor has submitted the reports required by this section. The report for each cargo tank must contain the following:

(i) Carrier's name, address of principal office, and telephone number;

(ii) Complete name plate data required by specs. MC 330 or MC 331, including data required by ASME Code;

(iii) Carrier's equipment number, which shall be the same as reported in accordance with § 177.824(f)(1)(iii) of this subchapter;

(iv) A statement indicating whether or not the tank was stress relieved after fabrication;

(v) Name and address of the person performing the test and date of test;

(vi) A statement of the nature and severity of defects found, if any. In particular, information must be furnished to indicate the location of defects detected, such as in a weld, a heat-affected zone, the liquid phase, the vapor phase, or the head-to-shell seam. If no defect or damage was discovered, that fact must be reported.

(vii) A statement indicating the methods employed to make repairs, who made the repairs, and the date they were completed. Also, a statement of whether or not the tank was stress relieved after repairs and, if so, whether full or local stress relieving was performed:

(viii) A statement of the disposition of cargo tank, such as "tank scrapped," or "returned to service;" and

(ix) A statement of whether or not the cargo tank is used for transportation of anhydrous ammonia, liquefied petroleum gas or any other commodity which shall be identified. Also, if the cargo tank was used for anhydrous ammonia, a statement indicating whether each shipment of ammonia was certified by its shipper as containing 0.2 percent water by weight.

(13) FILING OF REPORTS. The report required by this § 173.33 regarding test of tanks, must be retained by the carrier during the period the tank is in the carrier's service and for 1 year thereafter.

(14) SUPPLYING REPORTS. Each carrier offering a MC 330 or MC 331 cargo tank for sale or lease must make available for inspection a copy of any reports made under this paragraph to each prospective purchaser or lessee. Copies of such reports must be provided for the purchaser or lessee if the cargo tank is leased for more than 30 days.

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(15) RECORD OF INSPECTIONS. Each carrier shall prepare a record of inspections required by subparagraphs (d)(10) and (11) of this section. The inspection record shall be signed by the person conducting the inspections, and retained with the carrier's file copy of the report submitted under subparagraph (d)(12) of this section. The inspection record must identify by cargo tank manufacturer's serial number each cargo tank inspected and also indicate the name of the inspecting agency and person, the nature of any defect or damage discovered, and must state by what method the defect or damage was discovered. If no defect or damage was discovered upon inspection this fact must also be reported.

(i) The reports required of a carrier by subparagraphs (d)(12) and (13) of this section may be combined in a single report.

(e) The repair of tanks is authorized, provided such repairs are made under requirements prescribed in the "Code" for its original design and construction.

(1) In addition to any other provisions of the specification, no tank shall be repaired, or remodeled, as to cause leakage or cracks or likelihood of leakage or cracks, by areas of stress concentration due to shrinkage of cooling metal in welding operations, sharp fillets, reversal of stresses, or otherwise.

(2) No field welding shall be done except to non-pressure parts.

(f) On any tank used for a compressed gas except chlorine, the bursting pressure of all piping, pipe fittings, hose and other pressure parts except pump seals and safety relief devices must be at least 4 times the design pressure of the tank. In addition, the bursting pressure may not be less than 4 times any higher pressure to which each pipe, pipe fitting, hose and other pressure part may be subjected in service by the action of a pump or other device. For tanks used in transporting chlorine, see subparagraphs (8) through (10) of this paragraph.

(1) Welded pipe joints must be used wherever possible. Where copper tubing is permitted, joints must be brazed or be of equally strong metal union type. The melting point of brazing material must be no lower than 1900° F. The method of joining tubing must not decrease its strength, such as by the cutting of threads. Screwed fittings must be at least extra heavy. Nonmalleable metals may not be used in the construction of any valve or fitting.

(2) Each hose coupling must be designed for pressure at least 20 percent in excess of the hose design pressure and so there will be no leakage when connected.

(3) Provision must be made to prevent damage to piping due to thermal expansion and contraction, jarring, and vibration. Slip joints may not be used for this purpose.

(4) Piping and fittings must be grouped in the smallest practicable space and be protected from damage as required by the specification.

(5) All piping, valves, and fittings on every tank motor vehicle shall be proved free from leaks at not less than the design pressure for the tank. This condition will be considered to have been met when such piping, valves, and fittings have been tested for leakage with gas or air after installation and proved tight at not less than the design pressure marked on the cargo tank with which they are used. In the event of replacement, all such piping, valves, or fittings so replaced shall be tested in accordance with the requirements of this section before the tank is returned to transportation service. The requirements of this section shall apply with equal force to all hose used on such tanks, except that such hose may be so tested either before or after installation on the tank.

(6) Liquid pumps or gas compressors, wherever used, must be of suitable design, adequately protected against breakage by collisions, and kept in good condition. They may be driven by motor vehicle power takeoff or other mechanical, electrical, or hydraulic means. Unless they are of the centrifugal type, they shall be equipped with suitable pressure actuated by-pass valves permitting flow from discharge to suction or to the tank.

(7) Each tank used for the shipment of carbon dioxide or nitrous oxide shall be provided with a suitable pressure gauge. A shutoff valve must be installed between the pressure gauge and the tank. This gauge need be used only during the filling operation.

(8) CHLORINE CARGO TANKS. No piping, hose, or other means of loading or unloading may be attached to any valve of a cargo tank containing chlorine except at the time of loading or unloading. No hose, piping, or tubing used for loading or unloading may be mounted or carried

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on the motor vehicle. Except at the time of loading or unloading, the pipe connection of each angle valve must be closed with a screw plug which is chained or otherwise fastened to prevent misplacement.

(9) Chlorine cargo tank angle valves must be tested before installation to be leak free at not less than 225 p.s.i.g. using dry air or inert gas. The angle valves must also be tested as above once every five loadings or once a week whichever occurs first. At each loading, tanks must be inspected and the angle valves and gasketed joints must be examined and tested at a pressure of not less than 50 p.s.i.g. to determine that they are not leaking and are in proper condition for transportation. Leaks which are detected must be corrected before the cargo tank motor vehicle is shipped.

(10) Liquid chlorine pumps shall not be installed on cargo tank motor vehicles used for the shipment of chlorine.

(g) All materials of construction used in cargo tanks and their appurtenances shall not be subject to destructive attack by the contents of the tank.

(1) All parts of tanks and appurtenances for anhydrous ammonia shall be steel. No copper, silver, zinc, nor their alloys shall be permitted. Brazed joints shall not be permitted.

(h) Each outlet of cargo tanks used for the transportation of liquefied compressed gases, except carbon dioxide, shall be provided with an approved suitable automatic excess-flow valve or in lieu thereof may be fitted with an approved automatic quick-closing internal valve. These valves shall be located inside the tank or at a point outside the tank where the line enters or leaves the tank. The valve seat shall be located inside the tank or shall be located within a welded flange or its companion flange, or within a nozzle, or within a coupling. The installation shall be made in such a manner as reasonably to assure that any undue strain which causes failure requiring functioning of the valve shall cause failure in such a manner that it will not impair the operation of the valve.

EXCEPTION: Any liquid level gauging device which is constructed so that the outward flow of tank contents does not exceed that passed by a 0.060-inch diameter opening, or any safety device connection, is not required to be equipped with an excess-flow valve.

(1) Each excess-flow valve must close automatically at the rated flow of gas or liquid as specified by the valve manufacturer. The flow rating of the piping, fittings, valves, and hose on each side of the excess-flow valve must be greater than that of the excess-flow valve. If branching or any other restriction is incorporated in the system so that the flow rating is less than that of the excess-flow valve at the tank, additional excess-flow valves must be located where the flow rates are reduced.

(2) An excess-flow valve may be designed with a bypass, not to exceed 0.040-inch diameter opening, to allow equalization of pressures.

(3) Each filling and discharge line must be provided with a manual shut-off valve located as close to the tank as practicable. However, when an internal shut-off valve that closes automatically is used, a manual shut-off valve must be located in the line ahead of the hose connection. The use of a so-called "stop-check" or excess flow valve to satisfy the requirements of this rule and of paragraph (i) of this section with one valve is prohibited except as provided in § 178.337-11(c) of this subchapter.

(4) Angle valves and excess-flow valves on chlorine tank motor vehicles manufactured on or before December 31, 1974, must conform to the standards of The Chlorine Institute, Inc., as follows:

(i) An angle valve must conform to either Dwg. 104-4 dated May 5, 1958, or Dwg. 104-5, dated September 1, 1972.

(ii) An excess-flow valve conforming to either Dwg. 101-4 dated May 16, 1969, or Dwg. 104-6, dated September 1, 1973, must be installed under each liquid angle valve. An excess-flow valve conforming to either Dwg. 106-3, dated May 16, 1969, or Dwg. 106-5, dated September 1, 1973, must be installed under each gas angle valve.

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(i) REPAIR BY WELDING OR BRAZING OF DOT-4 SERIES, AND DOT-8, WELDED OR BRAZED CYLINDERS. Repairs on DOT-4 series and DOT-8 series welded or brazed cylinders are authorized to be made by welding or brazing. Such repairs must be made by a manufacturer of these types of DOT cylinders or by a repair facility authorized by the Bureau of Explosives and by a process similar to that used in its manufacture and under the following specific requirements:

(1) Cylinders with injurious defects in welded joints in or on pressure parts must be repaired by completely removing the defect prior to rewelding.

(2) Cylinders with injurious defects in brazed joints in or on pressure parts must be repaired by rebrazing.

(3) Cylinders during welding must be free of materials in contact with the welded joint that may impair the serviceability of the metal in or adjacent to the weld. (Precautions must be taken to prevent acetylene cylinder steels from picking up carbon during repair.)

(4) Neckrings, footrings, or other nonpressure attachments authorized by the specification may be replaced or repaired. Repair or replacement of footrings, neckrings, or other nonpressure attachments authorized by the specification for DOT-4BA and 8AL (§§ 178.51 and 178.60 of this subchapter) cylinders may be made without conforming to the requirements of subparagraph (i)(6) of this section provided the following requirements are met:

(i) Must be done by a manufacturer of these types of DOT cylinders or by a repair facility authorized by the Bureau of Explosives.

(ii) The welder shall have available to him information as to the procedure equipment, and rod used during manufacture and shall use a similar method for repair.

(iii) Repairs must be by metal arc welding only. Welds shall be 3 inches maximum length and spaced at least 3 inches apart.

(iv) Welds shall not be made on or near a brazed joint (to prevent the possibility of copper penetration).

(v) After repair the welds are to be inspected visually for weld quality.

(vi) After repair the weld area is to be leak tested at the service pressure of the cylinder.

(5) After removal, and before replacement of attachments, cylinders must be inspected and defective ones rejected, repaired or rebuilt.

(6) After repair, cylinders must be reheat-treated, tested, inspected and reported when and as prescribed by the specification covering their original manufacture when welding or brazing seams in a pressure part of a cylinder; or when welding or brazing on pressure parts of cylinders of plain carbon steels with carbon over 0.25 percent or manganese over 1.00 percent or of alloy steels except as provided in § 173.34(i)(7).

NOTE 1: Heat-treatment is not required after welding or brazing weldable low carbon parts to attachments of similar material which has been previously welded or brazed to the top or bottom of cylinders and properly heat-treated, provided such subsequent welding or brazing does not produce a temperature in excess of 400° F. in any part of the top or bottom material.

(7) Repair of cylinders must be followed by a proof pressure leakage test at prescribed test pressure and visual examination for weld quality when welding on pressure parts of cylinders of plain carbon 0.25 percent or less and manganese 1.00 percent or less, or when repairing steel types 1315, NAX and GLX by the following procedure:

(i) Leakage through the welding metal may be repaired without subsequent reheat treatment of the cylinder.

(ii) Repair permitted only be either the metal arc or tungsten inert gas shielded arc process, E7015, 7016, or 7018 electrodes not larger than 1/8-inch diameter shall be used for the metal arc process.

(iii) Weld defects must be removed by grinding or chipping before repair by the metal arc process. The tungsten inert gas shielded arc process may be used for repair only when such repair can be made by puddling. Repair weld shall not exceed 1 inch in length nor be closer than 3 inches to the next repair area.

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(iv) Repair of weld defects which have any cracking is not permitted.

(j) REPAIR OF NON-PRESSURE ATTACHMENTS. Repair of non-pressure attachments by welding or brazing without affecting a pressure part of the cylinder must be followed by visual examination for weld quality.

(k) PROHIBITED REPAIRS. Walls, heads or bottoms of cylinders with injurious defects or leaks in base metal shall not be repaired, but may be replaced as provided for in paragraph (1) of this section.

(1) REBUILDING OF DOT 4 SERIES AND DOT 8, WELDED OR BRAZED CYLINDERS. Rebuilding of DOT 4 series and DOT 8 series, welded or brazed cylinders is authorized. Such rebuilding must be done by a manufacturer of these types of DOT cylinders or by a repair facility authorized by the Bureau of Explosives and by a process similar to that used in its original manufacture and under the following specific requirements:

(1) The replacement of a pressure part such as wall, heads, or bottoms of cylinders or the replacement of the porous filling material, shall be considered as rebuilding.

(2) Rebuilt cylinders shall be considered as new cylinders and shall conform to all the requirements of the specifications applying, including verification of material, examination, inspection, etc., and the rendering of the proper reports to the purchaser, cylinder rebuilder, and the MTB-TSC. Report must show that cylinders were rebuilt.

(3) Information in sufficient detail regarding previous serial numbers and identification symbols must be filed with the MTB-TSC.

(Source: 17 Ill. Reg 4287, effective April 16, 1982)

§§ 173.35-173.49 (RESERVED)

SUBPART C-EXPLOSIVES AND BLASTING AGENTS; DEFINITIONS AND PREPARATION

§ 173.50 AN EXPLOSIVE.

(a) For the purpose of this subchapter an explosive is defined as any chemical compound, mixture, or device, the primary or common purpose of which is to function by explosion, i.e., with substantially instantaneous release of gas and heat, unless such compound, mixture, or device is otherwise specifically classified in this subchapter.

§ 173.51 FORBIDDEN EXPLOSIVES

Unless otherwise provided in this subchapter, the transportation of the following explosives is forbidden:

(a) Explosive compounds, mixtures or devices which ignite spontaneously or undergo marked decomposition when subjected to a temperature of 167° F. (75° C.) for 48 consecutive hours.

(b) New explosive compounds, mixtures or devices except as provided for in § 173.86.

(c) Explosive mixtures or devices containing an ammonium salt and a chlorate.

(d) Explosive mixtures or devices containing an acidic metal salt and a chlorate.

(e) Leaking or damaged packages of explosives.

(f) Nitroglycerin, diethylene glycol dinitrate or other liquid explosives not authorized by § 173.53(e) or (h). (For shipment by motor vehicle other than by common carrier, see § 177.822(b) of this subchapter.)

(g) Loaded firearms.

(h) Fireworks that combine an explosive and a detonator or blasting cap.

(i) Fireworks containing yellow or white phosphorous.

(j) Toy torpedoes, the maximum outside dimension of which exceeds 7/8-inch, or toy torpedoes containing a mixture of potassium chlorate, black antimony, and sulfur with an average weight of explosive composition in each torpedo exceeding four grains.

(Source: 7 Ill. Reg 3486, effective April 2, 1983)

§ 173.52 ACCEPTABLE EXPLOSIVES.

(a) For the purposes of this subchapter, acceptable explosives are divided into three classes as follows:

- (1) Class A explosives; detonating or otherwise of maximum hazard.
- (2) Class B explosives; flammable hazard.
- (3) Class C explosives; minimum hazard.

CLASS A EXPLOSIVES; DEFINITIONS

§ 173.53 DEFINITION OF CLASS A EXPLOSIVES.

(a) TYPE 1. Solid explosives which can be caused to deflagrate by contact with sparks or flame such as produced by safety fuse or an electric squib, but cannot be detonated (see Note 1) by means of a No. 8 test blasting cap (see Note 2). Example: Black powder and low explosives.

(b) TYPE 2. Solid explosives which contain a liquid explosive ingredient, and which, when unconfined (see Note 3), can be detonated by means of a No. 8 test blasting cap (see Note 2); or which can be exploded in at least 50 percent of the trials in the Bureau of Explosives' Impact Apparatus (see Note 4) under a drop of 4 inches or more, but cannot be exploded in more than 50 percent of the trials under a drop of less than 4 inches. Example: High explosives, commercial dynamite containing a liquid explosive ingredient.

(c) TYPE 3. Solid explosives which contain no liquid explosive ingredient and which can be detonated, when unconfined (see Note 3), by means of a No. 8 test blasting cap (see Note 2); or which can be exploded in at least 50 percent of the trials in the Bureau of Explosives' Impact Apparatus (see Note 4) under a drop of 4 inches or more, but cannot be exploded in more than 50 percent of the trials under a drop of less than 4 inches. Example: High explosives, commercial dynamite containing no liquid explosive ingredient, trinitrotoluene, amatol, teteryl, picric acid, urea nitrate, pentolite, and commercial boosters.

(d) TYPE 4. Solid explosives which can be caused to detonate when unconfined (see Note 3), by contact with sparks or flame such as produced by safety fuse or an electric squib; or which can be exploded in the Bureau of Explosives' Impact Apparatus (see Note 4), in more than 50 percent of the trials under a drop of less than 4 inches. Example: Initiating and priming explosives, lead azide, fulminate of mercury, etc., and high explosives.

(e) TYPE 5. Desensitized liquid explosives are explosives which may be detonated separately or when absorbed in sterile absorbent cotton, by a No. 8 test blasting cap (see Note 2); but which cannot be exploded in the Bureau of Explosives' Impact Apparatus (see Note 4), by a drop of less than 10 inches. The desensitizer must not be significantly more volatile than nitroglycerine and the desensitized explosive must not freeze at temperatures above minus 10° F. Example: High explosives, desensitized nitroglycerine.

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(f) TYPE 6. Liquid explosives that can be exploded in the Bureau of Explosives' Impact Apparatus (see Note 4) under a drop of less than 10 inches. Example: Nitroglycerin. (See § 173.51(a)(3).)

(g) TYPE 7. Blasting caps (see Note 5) are small tubes, usually made of an alloy of either copper or aluminum, or of molded plastic closed at one end and loaded with a charge of initiating or priming explosives, class A-Type 4, either with or without other suitable explosives. The total weight of explosives per unit shall not exceed 150 grains. Blasting caps (see Note 5) which have been provided with a means for firing by an electric current, and sealed, are known as electric blasting caps.

(1) Detonating primers are devices for commercial use which contain a detonator and an additional charge of explosives, all assembled in a suitable envelope.

(2) Detonating fuzes, class A, are used in the military service to detonate the high explosive bursting charges of projectiles, mines, bombs, torpedoes, and grenades. In addition to a powerful detonator, they may contain several ounces of a high explosive, such as tetryl or dry nitrocellulose, all assembled in a heavy steel envelope. They may also contain a small amount of radioactive component. Those that are so made and packed that they will not cause functioning of other fuzes, explosives, or explosive devices in the same or adjacent containers are classed as class C explosives.

(h) TYPE 8. Any solid or liquid compound, mixture or device which is not specifically included in any of the above types, and which under special conditions may be so designated and approved by the Bureau of Explosives. Example: Shaped charges, commercial.

(1) A shaped charge, commercial, consists of a plastic, paper, or other suitable container comprising a charge of not to exceed 8 ounces of a high explosive containing no liquid explosive ingredient and with a hollowed-out portion (cavity) lined with a rigid material. Detonators or other initiating elements shall not be assembled in the device unless approved by the Bureau of Explosives.

NOTE 1: The detonation test is performed by placing the sample in an open-end fiber tube which is set on the end of a lead block approximately 1-1/2 inches in diameter and 4 inches high which, in turn, is placed on a solid base. A steel plate may be placed between the fiber tube and the lead block.

NOTE 2: A No. 8 test blasting cap is one containing two grams of a mixture of 80 percent mercury fulminate and 20 percent potassium chlorate, or a cap of equivalent strength.

NOTE 3: "Unconfined" as used in this section does not exclude the use of a paper or soft fiber tube wrapping to facilitate tests.

NOTE 4: The Bureau of Explosives' Impact Apparatus is a testing device designed so that a guided 8-pound weight may be dropped from predetermined heights so as to impact specific quantities of liquid or solid materials under fixed conditions. Detailed prints may be obtained from the Bureau of Explosives, 1920 L St., N.W., Washington, D.C. 20036.

NOTE 5: Blasting caps, blasting caps with safety fuse, or electric blasting caps in quantities of 1,000 or less are classified as class C explosives.

(i) AMMUNITION FOR CANNON. Ammunition for cannon is fixed, semi-fixed or separate loading ammunition which is fired from a cannon, mortar, gun, howitzer or recoilless rifle.

(j) AMMUNITION FOR CANNON WITH PROJECTILES. Ammunition from cannon with explosive projectiles, gas projectiles, smoke projectiles, incendiary projectiles, illuminating projectiles, or shell is fixed ammunition assembled in a unit consisting of the cartridge case containing the propelling charge and primer, and the projectiles, or shell, fuzed or unfuzed. Detonating fuzes, tracer fuzes, explosive or ignition devices, or fuze parts with explosives contained

materials under fixed conditions. Detailed prints may be obtained from the Bureau of Explosives, 2 Pennsylvania Plaza, New York, New York, 10001.

NOTE 5: Blasting caps, blasting caps with safety fuse, or electric blasting caps in quantities of 1,000 or less are classified as class O explosives.

(i) *Ammunition for cannon.* Ammunition for cannon is fixed, semi-fixed or separate loading ammunition which is fired from a cannon, mortar, gun, howitzer or recoilless rifle.

(j) *Ammunition for cannon with projectiles.* Ammunition for cannon with explosive projectiles, gas projectiles, smoke projectiles, incendiary projectiles, illuminating projectiles, or shell is fixed ammunition assembled in a unit consisting of the cartridge case containing the propelling charge and primer, and the projectiles, or shell, fuzeed or unfuzed. Detonating fuzes, tracer fuzes, explosive or ignition devices, or fuze parts with explosives contained therein must not be assembled in ammunition or included in the same outside package unless shipped by, for, or to the Departments of the Army, Navy, and Air Force of the United States Government or unless of a type approved by the Bureau of Explosives.

(k) *Explosive projectiles.* Explosive projectiles are shells, projectiles, warheads, or rocket heads, loaded with explosives or bursting charges, with or without other materials, for use in cannons, guns, tubes, mortars or other firing or launching devices.

(l) *Grenades.* Grenades, hand or rifle, are small metal or other containers designed to be thrown by hand or projected from a rifle. They are filled with an explosive or a liquid, gas, or solid material such as a toxic or tear gas or an incendiary or smoke producing material and a bursting charge. When shipped without explosives or bursting charges, see §§ 173.100(y), 173.330, 173.350, and 173.385.

(m) *Explosive bombs.* Explosive bombs are metal or other containers filled with explosives. They are used in warfare and include aeroplane bombs and depth bombs.

(n) *Explosive mines.* Explosive mines are metal or composition containers filled with a high explosive.

(o) *Explosive torpedoes.* Explosive torpedoes, such as are used in warfare, are metal devices containing a means of propulsion and a quantity of high explosives.

(p) *Rocket ammunition.* Rocket ammunition (including guided missiles) is ammunition designed for launching from a tube, launcher, rails, trough, or other launching device, in which the propellant material is a solid propellant explosive. It consists of an igniter, rocket motor, and projectile (warhead) either fuzeed or unfuzed, containing high explosives or chemicals. Rocket ammunition may be shipped completely assembled or may be shipped unassembled in one outside container.

(q) *Ammunition for small arms with explosive projectiles or incendiary projectiles.* Ammunition for small arms with explosive projectiles and ammunition for small arms with incendiary projectiles is fixed ammunition of caliber 20 millimeters to be used in machine guns or cannons, and consists of a metallic cartridge case, the primer and the propelling charge, with explosive projectile or incendiary projectile with or without detonating fuze; the component parts necessary for one firing being all in one assembly. Detonating fuzes, tracer fuzes, explosive or ignition devices or fuze parts with explosives contained therein must not be assembled in ammunition or included in the same outside package unless shipped by, for or to the Departments of the Army, Navy, and Air Force of the U.S. Government or unless of a type approved by the Department.

(r) *Chemical ammunition.* Chemical ammunition used in warfare is all kinds of explosive chemical projectiles, shells, bombs, grenades, etc., loaded with toxic, tear, or other gas, smoke or incendiary agent, also such miscellaneous apparatus as cloud-gas cylinders, smoke generators, etc., that may be utilized to project chemicals.

(s) *Boosters, bursters, and supplementary charges.* Boosters and supplementary charges consist of a casing containing a high explosive and are used to increase the intensity of explosion of the detonator of a detonating fuze. Bursters consist of a casing containing a high explosive and are used to rupture a projectile or bomb to permit release of its contents.

(t) *Jet thrust units (jato), class A explosives; rocket motors, class A explosives; igniters, jet thrust (jato), class A explosives; and igniters, rocket motor, class A explosives:*

(1) Jet thrust units (jato), class A explosives, are metal cylinders contain-

ing a mixture of chemicals capable of burning rapidly and producing considerable pressure. Under certain conditions the chemical fuel with which the unit is loaded may explode. Jet thrust units are designed to be ignited by an electric igniter. They are used to assist aeroplanes to take off.

(2) Rocket motor, class A explosives, is a device containing a propelling charge and consisting of one or more continuous type combustion unit(s) closed at one end (closure may be an igniter with a thrust plate) and with a nozzle(s) at the other end. (The rocket motor carries its own solid oxidizer-fuel combination.) The propelling charge consists of a mixture of chemicals and/or chemical compounds which when ignited is capable of burning rapidly and producing considerable pressure and which will sustain a detonation. Rocket motors, class A explosives, should be nonpropulsive in shipment (see subdivisions (i) and (ii) of this subparagraph). Rocket motors, class A explosives, are designed to be ignited by an electrically actuated device which may be an igniter, or by other means. They are used to propel and/or provide thrust for guided missiles, rockets, or spacecraft.

(i) A rocket motor to be considered "nonpropulsive" must be capable of unrestrained burning and will not move appreciably in any direction when ignited by any means. Blast defectors, thrust neutralizers, or other similar devices must be proven adequate by test prior to authorization for use.

(ii) Rocket motors, class A explosives may be shipped in a propulsive state only under conditions approved by the Department of Defense.

(3) Igniters, jet thrust (jato), class A explosives, and igniters, rocket motor, class A explosives, are devices consisting of an electrically operated or remotely controlled ignition element and a charge of fast-burning composition meeting the definition prescribed for Type 1 class A explosives (see paragraph (a) of this section), assembled in a unit for use in igniting the propelling charge of jet thrust units or rocket motors.

(u) *Charged oil well jet perforating guns.* Charged oil well jet perforating guns are steel tubes or metallic strips into which are inserted shaped charges connected in series by primacord. Shaped charges must be of a type described in paragraph (h) (1) of this section, except that each shaped charge installed in the steel tube or metallic strip

shall contain not over 4 ounces of high explosive. Charged oil well jet perforating guns must not be transported with blasting caps, electric blasting caps, or other firing devices affixed to or installed in the guns.

(v) *Type 9. Propellant explosives, class A.* are solid chemicals or solid chemical mixtures which are designed to function by rapid combustion of successive layers, generally with little or no smoke. The combustion is controlled by composition, size, and form of grain. Propellant explosives, class A, include some types of smokeless powder and some types of solid propellant explosives for jet thrust units, rockets, or other devices. Any propellant explosive is class A which detonates in any one out of five trials when tested in the packages in which it is offered for transportation. In conducting the test, one propellant container shall be surrounded by inert loaded containers of the same weight, including one inert container placed on top of the propellant container. The propellant shall be ignited by means of a commercial electric squib placed within 4 inches of the bottom of the container. The presence of a crater and absence of flame shall be considered as evidences of detonation.

§ 173.54 Ammunition for cannon.

(a) Ammunition for cannon with explosive projectiles, gas projectiles, smoke projectiles, incendiary projectiles, illuminating projectiles, or shell must be packed and properly secured in strong wooden or metal containers, or in plastic containers as listed on U.S. Army Materiel Command Drawing No. A-9205248, dated December 9, 1964.

(b) Each outside package must be plainly marked "AMMUNITION FOR CANNON WITH EXPLOSIVE PROJECTILES," "AMMUNITION FOR CANNON WITH SMOKE PROJECTILES," "AMMUNITION FOR CANNON WITH INCENDIARY PROJECTILES," or "AMMUNITION FOR CANNON WITH ILLUMINATING PROJECTILES," as appropriate.

§ 173.55 Ammunition, nonexplosive.

(a) Nonexplosive ammunition is defined as a device which contains no explosives or other dangerous articles, such as cartridge cases, dummy or drill cartridges; empty, sand loaded or solid projectiles with or without tracers (containing not in excess of

one ounce of tracer composition), empty mines, empty bombs, solid projectiles, empty torpedoes, or practice bombs. It also includes devices containing no explosives, or other dangerous articles, except installed electric squibs, primers, propellants or thermal batteries required for the activation of the device, provided that it has been proven by test that when initiated the full energy release is contained within the outside shipping container. Such ammunition is exempt from Parts 170-179 of this chapter. Rotating bands should be protected against deformation by method of packing or loading.

§ 173.56 Ammunition, projectiles, grenades, bombs, mines, gas mines, and torpedoes.

(a) Detonating fuzes, tracer fuzes, explosive or ignition devices, bouchons, or fuze parts with explosives contained therein, must not be assembled in explosive projectiles, grenades, explosive bombs, explosive mines, or explosive torpedoes, or included in the same outside package with them unless shipped by, for, or to the Departments of the Army, Navy, and Air Force of the United States Government or unless of a type approved by the Bureau of Explosives.

(b) Explosive projectiles, explosive torpedoes, explosive mines, explosive bombs, or explosive grenades except as provided in paragraph (c) of this section, must be packed and properly secured in strong wooden or metal boxes.

(c) Explosive projectiles, explosive torpedoes, explosive mines, or explosive bombs, exceeding 90 pounds in weight, and explosive projectiles of not less than 4½ inches in diameter, may be shipped without being boxed only by, for, or to the Departments of the Army, Navy, and Air Force of the United States Government when securely blocked and braced in accordance with methods approved by the Bureau of Explosives.

(1) Explosive projectiles less than 4½ inches in diameter may be shipped without being boxed, when palletized, only by, for, or to the Departments of the Army, Navy, and Air Force of the United States Government when securely blocked and braced in accordance with methods approved by the Bureau of Explosives.

(d) Gas projectiles, smoke projectiles, incendiary projectiles, illuminating projectiles, gas bombs, smoke bombs, incendiary bombs, gas grenades, smoke grenades, incendiary grenades, and gas mines, explosive, containing a bursting charge must be packed and properly se-

cured in strong wooden boxes. Detonating fuzes, boosters or bursters, bouchons or ignition elements must not be assembled in these articles or included in the same package with them unless shipped by, for, or to the Departments of the Army, Navy, or Air Force of the United States Government or unless of a type approved by the Bureau of Explosives. (See §§ 173.190, 173.330, 173.350, and 173.383 for nonexplosive chemical or poisonous ammunition.)

(e) The gross weight of a box containing more than one projectile, mine, grenade, or bomb must not exceed 250 pounds.

(1) Explosive bombs packed more than one in shipping containers having gross weights not in excess of 1,400 pounds may be shipped by, for or to the Departments of the Army, Navy, and Air Force of the U.S. Government.

(f) Each exterior package or projectile, bomb, or mine must be plainly marked "Explosive Projectile," "Explosive Torpedo," "Explosive Mine," "Explosive Bomb," "Hand Grenades," or "Rifle Grenades," as the case may be, except that each device need not be so marked when palletized and the palletized units are plainly marked and shipped as carload or truckload shipments.

(g) Bombs, projectiles, grenades, ammunition for cannon with gas projectiles, or other packagings loaded with Poison A, and an explosive charge, either boxed or unboxed (see paragraph (c) of this section) must bear the POISON GAS label in addition to the EXPLOSIVE label.

(h) For regulations for shipping ammunition containing chemicals but no explosives or bursting charges, see chemical ammunition, §§ 173.330, 173.350, and 173.383.

§ 173.57 Rocket ammunition.

(a) Rocket ammunition with explosive projectiles, gas projectiles, smoke projectiles, incendiary projectiles, or illuminating projectiles must be well packed and properly secured in strong wooden or metal containers or in pre-formed fiber glass resin impregnated containers approved by the Bureau of Explosives.

(b) Each outside package must be plainly marked "ROCKET AMMUNITION WITH EXPLOSIVE PROJECTILES," "ROCKET AMMUNITION WITH GAS PROJECTILES," "ROCKET

AMMUNITION WITH SMOKE PROJECTILES," "ROCKET AMMUNITION WITH INCENDIARY PROJECTILES," or "ROCKET AMMUNITION WITH ILLUMINATING PROJECTILES," as appropriate.

§ 173.58 [Reserved]

§ 173.59 Chemical ammunition, explosive.

(a) When chemical elements of ammunition are shipped assembled with their detonating fuzes or bursting charges, they must be shipped in conformity with the regulations prescribed for explosive articles, class A, see § 173.56. For shipment of these articles not containing ignition elements, bursting charges, detonating fuzes, or other explosive components, see § 173.330, § 173.350, and § 173.383. For shipment of these articles assembled with their ignition elements or expelling charges but without any detonating or bursting charge see § 173.88(d).

§ 173.60 Black powder and low explosives.

(a) Black powder and low explosives must be packed in containers complying with the following specifications:

- (1) [Reserved]
- (2) Spec. 13 (§ 178.140 of this subchapter). Metal kegs, not less than 7 inches long. Net weight not less than 6¼ pounds nor more than 150 pounds.
- (3) Bundles of metal kegs, spec. 13 (§ 178.140 of this subchapter), firmly tied together with rope and wrapped in strong burlap, canvas, or similar material, securely sewed and roped, authorized. Net weight of powder must not exceed 100 pounds.
- (4) Spec. 14, 15A, or 16A (§§ 178.165, 178.168, or 178.185 of this subchapter). Wooden boxes with inside containers which must be spec. 13 (§ 178.140 of this subchapter), metal kegs, or fiber or metal containers not over 1½ pounds capacity each, or cotton bags of at least 4 ounce cotton duck not over 25 pounds capacity each. The gross weight of spec. 14 boxes not to exceed 140 pounds and the gross weight of spec. 15A or 16A boxes not to exceed 200 pounds.
- (5) Spec. 14, 15A, or 16A (§§ 178.165, 178.168, or 178.185 of this subchapter). Wooden boxes with inside cylindrical fiber cartridges not over 5 inches diameter nor over 18 inches long with fiber at least 0.05 inch thick paraffined on

outer surface with joints securely glued or cemented, or strong paraffined paper cartridges not over 12 inches long authorized only for compressed pellets (cylindrical block) ⅞ inch or more in diameter. Boxes must be completely lined with strong paraffined paper or other suitable waterproofed material without joints or other openings at the bottom or sides. Authorized gross weight not to exceed 75 pounds.

(6) Spec. 12H, 23F, or 23H (§§ 178.209, 178.214, or 178.219 of this subchapter). Fiberboard boxes with inside cylindrical fiber cartridges not over 5 inches diameter nor over 18 inches long with fiber at least 0.05 inch thick paraffined on outer surface with joints securely glued or cemented, or strong paraffined paper cartridges not over 12 inches long authorized only for compressed pellets (cylindrical block) ⅞ inch or more in diameter. Authorized gross weight not to exceed 65 pounds.

(b) Black powder (not low explosives) in addition to containers specified in paragraph (a) of this section, must be shipped in containers complying with the following specifications:

(1) Spec. 14, 15A, or 16A (§§ 178.165, 178.168, or 178.185 of this subchapter). Wooden boxes with inside containers which must be cloth or paper bags of capacity not exceeding 25 pounds net weight, provided the completed shipping package shall be capable of standing a drop of 4 feet without rupture of inner or outer containers. The completed package must not exceed 50 pounds, net weight of black powder.

(2) Spec. 12H, 23F, or 23H (§ 178.209, 178.214, or 178.219 of this subchapter). Fiberboard boxes with inside containers which must be cloth, paper, or securely closed polyethylene bags constructed of material not less than 0.004 inch thick of capacity not exceeding 25 pounds net weight for cloth or paper bags and not exceeding 50 pounds net weight for polyethylene bags, or inside fiber or metal containers having not over 1 pound capacity each, provided the completed shipping package shall be capable of withstanding a drop of 4 feet without rupture of inner or outer containers. The tubes of the box may be eliminated and a single tube as specified in spec. 23F (§ 178.214 of this subchapter) may be substituted. The completed package shall not contain more than 50 pounds net weight of black powder.

(3) Spec. 17E (§ 178.116 of this sub-

chapter). Metal drums (single-trip), not over 5 gallons capacity each, without opening except bunghole not exceeding 2.3 inches in diameter. Authorized for truck-load shipments only.

(c) Black pellet powder primed with an electric squib secured inside the coaxial hole of the pellet powder with loose ends of the wires of the squib effectively short-circuited may be shipped in containers complying with the following specifications:

(1) Spec. 14, 15A, or 16A (§§ 178.165, 178.168 or 178.185 of this subchapter). Wooden boxes with inside cartridges which must be strong paraffined paper cartridges not over 12 inches long authorized only for compressed pellets (cylindrical block) $\frac{1}{8}$ inch or more in diameter. Boxes must be lined as prescribed for cylindrical fiber cartridges. Gross weight not to exceed 65 pounds.

(d) Low explosives (not black powder) may in addition to the containers specified in paragraph (a) of this section, be shipped in containers complying with the following specifications:

(1) Spec. 14, 15A, or 16A (§§ 178.165, 178.168, or 178.185 of this subchapter). Wooden boxes with inside containers which must be strong paper bags of capacity not exceeding 25 pounds. Gross weight of spec. 14 box must not exceed 140 pounds. Gross weight of spec. 15A or 16A box must not exceed 200 pounds.

(2) Spec. 12H, 23F, or 23H (§ 178.209, § 178.214 or § 178.219 of this subchapter). Fiberboard boxes with inside containers which must be strong paper bags of capacity not exceeding 25 pounds. Gross weight must not exceed 65 pounds.

(3) Spec. 15A (§ 178.168 of this subchapter). Wooden boxes, lined, spec. 2L (§ 178.30 of this subchapter). Authorized only for low explosives in the form of hard nonplastic rods or cylinders not less than $\frac{1}{8}$ -inch diameter.

(e) Each outside package must be plainly marked, stamped, or stenciled "BLACK POWDER" or "LOW EXPLOSIVES," and may also show "BLASTING," "RIFLE," etc., as "BLACK BLASTING POWDER," "BLACK RIFLE POWDER," "LOW BLASTING EXPLOSIVE" or "BLACK PELLET POWDER," as the case may be.

(1) Inside containers of over $1\frac{1}{2}$ pounds capacity each in boxes, must be packed with filling holes up, and the boxes must be marked on top "THIS SIDE UP."

§ 173.61 High explosives.

(a) High explosives (dynamite), except gelatin dynamite, when offered for transportation by rail freight or highway must not contain in excess of 60 percent of liquid explosive ingredient and when offered for transportation by carrier by water must not contain in excess of 75 percent of liquid explosive ingredient. Maximum limit of liquid explosive ingredient specified for transportation by carrier by water applies only for such explosives as consist principally of wood pulp or other satisfactory absorbent and liquid explosive, which are comparable with good commercial dynamite under tests as to leakage of liquid ingredient and sensitiveness to the shocks of transportation, and for shipments that are otherwise in compliance with the regulations in Parts 170-179 of this subchapter, for the transportation of high explosives.

(b) High explosives consisting of a liquid mixed with an absorbent material must have the absorbent (wood pulp or similar material) in sufficient quantity and of satisfactory quality, properly dried at the time of mixing; nitrate of soda must be dried at the time of mixing to less than 1 percent of moisture; and the ingredients must be uniformly mixed so that the liquid will remain thoroughly absorbed under the most unfavorable conditions incident to transportation.

(c) High explosives containing nitroglycerin or other liquid explosive ingredients must have uniformly mixed with an absorbent material a satisfactory antacid, which must be in quantity sufficient to have the acid neutralizing power of an amount of magnesium carbonate equal to 1 percent of the nitroglycerin or other liquid explosive ingredient.

(d) Cartridges shall consist of a column of explosives completely inclosed in a shell made of strong paper or polyethylene or a combination of paper and polyethylene, so treated that it will not absorb the liquid ingredient of the explosive.

(e) Bags shall be made of strong paper or equally efficient material so treated or of such nature that it will not absorb the liquid ingredient of the explosive.

(f) All boxes in which high explosives are packed must be lined with strong paraffined paper or other suitable material, except as provided in paragraph

(j) of this section, § 173.64 (a) (5), and § 173.65 (a) (5). Lining must be without joints or other openings or with cemented joints at the bottom, ends or sides of boxes, and for explosives with liquid ingredients must be impervious to such ingredient and also to water. Covers of boxes must be protected from contact with explosives by lining paper or other suitable material. (See spec 2L (§ 178.30 of this subchapter), for authorized lining material.)

(g) Before cartridges or bags of gelatin explosives are packed in boxes, lined in accordance with paragraph (f) of this section, dry fine wood pulp or sawdust at least $\frac{1}{4}$ inch in depth must be spread over the bottom of box or bottom of box may have a full area pad formed of absorptive cellulose sheet having nitroglycerin absorptive value equivalent to sawdust as specified; similar materials are required in boxes for packing all non-gelatinous types of explosives containing 30 percent or more liquid explosive ingredient.

(h) Except for cartridges containing gelatin dynamite, all cartridges of high explosives exceeding 4 inches in length and containing more than 10 percent of a liquid explosive ingredient must be placed horizontally in boxes. Bags must be packed with their filling holes up.

(i) Movement of cartridges and bags of high explosives within the boxes shall be prevented by sufficiently tight packing.

(j) High explosives (dynamite), except gelatin dynamite, packed in bags or in cartridges in excess of 2 inches in diameter and containing not more than 30 percent liquid explosive ingredients may be packed in outside containers without sawdust and without lining paper provided either each inside or outside container is sift-proof and is so treated as to prevent penetration by the commodity with which the container is filled for shipping.

§ 173.62 High explosives, liquid.

(a) Liquid explosives as defined in § 173.53(e) must be packed in specification containers as follows:

(1) Spec. 15L (§ 178.176 of this subchapter). Wooden boxes which must be plainly marked on top and on one side or end "HIGH EXPLOSIVES—DANGEROUS" in letters not less than $\frac{1}{8}$ inch in height. The tops of boxes must be marked "THIS SIDE UP".

(2) Spec. 15M (§ 178.177 of this subchapter). Wooden boxes. Metal inside

containers shall contain not more than 10 quarts liquid explosives each. Boxes must be plainly marked on top and on one side or end "HIGH EXPLOSIVES—DANGEROUS" in letters not less than $\frac{1}{8}$ inch in height. The tops of boxes must be marked "THIS SIDE UP".

(3) Spec. MC-200 (§ 178.315 of this subchapter). Motor vehicle container.

§ 173.63 High explosive with liquid explosive ingredient.

(a) High explosives (dynamite) containing not more than 30 percent liquid explosive ingredients must be prepared as prescribed in § 173.61, except as otherwise specified, and packed in containers complying with the following specifications:

(1) Spec. 23G (§ 178.218 of this subchapter). Fiberboard boxes. Not more than one cartridge in each box. High explosives packed in boxes consisting of more than one tube joined circumferentially are exempt from the requirements of § 173.61 (f) and (g). High explosives packed in boxes consisting of one tube closed at the ends are exempt from the requirements of § 173.61 (d), (f), and (g). Gross weight of boxes not to exceed 65 pounds.

(2) Spec. 14, 15A, or 16A (§ 178.165, § 178.168, or § 178.185 of this subchapter). Wooden boxes, or spec. 12H, 23F, or 23H (§ 178.209, § 178.214, or § 178.219 of this subchapter) fiberboard boxes, with inside containers which must be cartridges not exceeding 12 inches in diameter or 50 pounds in weight with length not to exceed 36 inches, or bags not exceeding 50 pounds each securely closed so as to prevent leakage therefrom. Gross weight of wooden boxes not to exceed 75 pounds and gross weight of fiberboard boxes not to exceed 65 pounds.

(3) Spec. 23F or 23H (§ 178.214 or § 178.219 of this subchapter). Fiberboard boxes having one inside 26-gauge metal container, measuring not over 8 inches in diameter and 31 inches long, containing high explosives (ammonium dynamite core) surrounded by nitro-carbonitrile. Authorized gross weight not to exceed 65 pounds.

(b) High explosives (dynamite) containing 10 percent or less of a liquid explosive ingredient in cartridges or bags as prescribed in § 173.61 (d) and (e) may be packed in wooden boxes, spec. 14, 15A or 16A (§ 178.165, § 178.168, or § 178.185 of this subchapter), gross weight not to exceed 140 pounds, or fiberboard boxes, spec. 12H, 23F, or 23H (§ 178.209,

§ 178.214, or § 178.219 of this subchapter), gross weight not to exceed 65 pounds.

(1) High explosives (dynamite) containing 10 percent or less of a liquid explosive ingredient may be packed in fiberboard boxes, spec. 23G (§ 178.218 of this subchapter). Not more than one cartridge in each box. High explosives packed in boxes consisting of more than one tube joined circumferentially are exempt from the requirements of § 173.61 (f) and (g). High explosives packed in boxes consisting of one tube closed at the ends are exempt from the requirements of § 173.61 (d), (f), and (g). Gross weight of boxes not to exceed 65 pounds.

(c) High explosives (dynamite) containing more than 30 percent liquid explosive ingredients must be prepared as prescribed in § 173.61 (a) to (i), inclusive, except as otherwise specified, and in containers complying with the following specifications:

(1) Spec. 14, 15A, or 16A (§§ 178.165, 178.168, or 178.185 of this subchapter) wooden boxes or spec. 12H, 23F, or 23H (§§ 178.209, 178.214, or 178.219 of this subchapter) fiberboard boxes. Inside containers must consist of:

(i) Cartridges not exceeding 4 inches in diameter and not exceeding 8 inches in length.

(ii) Cartridges exceeding 4 inches in diameter and not exceeding 5 inches in diameter and between 8 inches and not exceeding 10 inches in length must be redipped in melted paraffin or equivalent material.

(iii) Two or more cartridges that must be redipped because of their size may be enclosed in another strong paper shell to form a completed cartridge not exceeding 30 inches in length. The resulting cartridge must be dipped in melted paraffin or equivalent material.

(iv) Gross weight of wooden boxes not to exceed 75 pounds and gross weight of fiberboard boxes not to exceed 65 pounds.

(2) Spec. 14, 15A, or 16A (§ 178.165, § 178.168, or § 178.185 of this subchapter) wooden boxes, or spec. 12H, 23F, or 23H (§ 178.209, § 178.214, or § 178.219 of this subchapter), fiberboard boxes, with inside containers which must be paraffined two-ply paper bags not exceeding 12½ pounds capacity, securely closed by folding the tops and securing the fold by tape, with not more than two such bags inserted into another two-ply paper bag which must be securely closed and

dipped in paraffin after closing, or with not more than two inside containers which must be securely closed polyethylene bags not less than 0.004 inch in thickness of not more than 12½ pounds capacity each packed in a securely closed polyethylene or paper bag and packed in polyethylene lined outside fiberboard boxes. Gross weight of wooden boxes not to exceed 75 pounds and gross weight of fiberboard boxes not to exceed 65 pounds.

(d) High explosives (gelatin dynamite and blasting gelatin) must be prepared as prescribed in § 173.61 (a) to (i) inclusive, except as otherwise specified, and in containers complying with the following specifications:

(1) Spec. 23G (§ 178.218 of this subchapter). Fiberboard boxes. Not more than one cartridge in each box. High explosives packed in boxes consisting of more than one tube joined circumferentially are exempt from the requirements of § 173.61 (f) and (g) or when packed in boxes consisting of one tube closed at the ends are exempt from the requirements of § 173.61 (d) to (g), inclusive. Gross weight of boxes not to exceed 65 pounds.

(2) Spec. 14, 15A, or 16A (§ 178.165, § 178.168, or § 178.185 of this subchapter). Wooden boxes, or spec. 12H, 23F, or 23H (§ 178.209, § 178.214, or § 178.219 of this subchapter), fiberboard boxes, with inside containers which must be cartridges not exceeding 12 inches in diameter or 50 pounds in weight with length not to exceed 36 inches, or bags not exceeding 12½ pounds each. Bags if not completely sealed against leakage by method of closure must be packed with filling holes up. Gross weight of wooden boxes not to exceed 75 pounds and gross weight of fiberboard boxes not to exceed 65 pounds.

(3) High explosives (gelatin dynamite or blasting gelatin) may be shipped in a package consisting of not more than 6 cartridges of such explosives, each not exceeding 32 inches in length or 5 inches in diameter, cartridge with heavy paper in such manner as to have the approximate strength of a spec. 23G (178.218 of this subchapter) container, which cartridges shall in turn be placed in a 10-ply paper tube not exceeding 11 feet in length. The outer paper tube must be equipped with a metal cone or equally efficient device on one end which shall serve to close that end of the tube and to the metal cone shall be affixed a wire threaded through the fiber tubes running through the center of each of

the 6 cartridges; or as an alternative to the single wire running through the cartridges in the outer tube at the center, two wires may be applied, one on each side of the cartridges and between the outside of the cartridges and the inside of the outer tube. In either event, cartridges and the outer tube shall be securely closed so as to prevent spilling of any loose explosive under any conditions normally incident to transportation and cartridges shall be so loaded and stayed within the motor vehicle as to prevent damage to individual containers. The total gross weight of each completed package shall not exceed 125 pounds. Shipments are authorized in truck load lots only without transfer of packages other than such transfers as may be necessary in the event of mechanical failure of the vehicle in which originally loaded.

(e) High explosives (straight gelatin dynamites of 80 percent strength and over and blasting gelatin) must be packed in cartridges or in bulk in outside boxes. When packed in bulk in boxes double lining paper throughout must be used. Containers must comply with the following specifications:

(1) Spec. 14, 15A, or 16A (§§ 178.165, 178.168, or 178.185 of this subchapter). Wooden boxes.

(2) Spec. 12H, 23F, 23G, or 23H (§ 178.209, § 178.214, § 178.218, or § 178.219 of this subchapter). Fiberboard boxes. Spec. 23G must be packed in an outer container consisting of at least 7-ply heavy Kraft paper (see § 173.25 for additional required marking).

(3) Gross weight of wooden boxes not to exceed 75 pounds. Gross weight of fiberboard boxes not to exceed 65 pounds.

(f) Boxes containing high explosives must be plainly marked on top and on one side or end, except those made in compliance with spec. 23G which must be marked on the side or end, and kegs, drums, or barrels containing high explosives must be marked on both ends "HIGH EXPLOSIVES—DANGEROUS" in letters not less than $\frac{1}{16}$ inch in height. The tops of boxes except those made in compliance with spec. 23G, must be marked "THIS SIDE UP".

§ 173.64 High explosives with no liquid explosive ingredient and propellant explosives, Class A.

(a) High explosives containing no liquid explosive ingredients if their sensitiveness to percussion is not greater than that measured by the blow delivered by an 8-pound weight dropping from a distance of 7 inches on a com-

pressed pellet of the explosive three-hundredths of an inch thick and two-tenths of an inch in diameter, confined rigidly between hard steel surfaces as in the standard Impact Testing Apparatus of the Bureau of Explosives, must be packed in cartridges or in bags in outside boxes. They must be packed in cartridges when their sensitiveness is greater than the limit prescribed herein. Such explosives when dry may be packed in strong sift-proof cloth or paper bags of capacity not exceeding 25 pounds. These explosives must be packed in outside containers complying with the following specifications:

(1) Spec. 14, 15A, or 16A (§§ 178.165, 178.168, or 178.185 of this subchapter). Wooden boxes.

(2) Spec. 12H, 23F, or 23H (§ 178.209, § 178.214, or § 178.219 of this subchapter). Fiberboard boxes.

(3) [Reserved]

(4) Gross weight of wooden boxes not to exceed 140 pounds. Gross weight of fiberboard boxes not to exceed 65 pounds.

(5) When such explosives contain over 5 percent moisture, box must have an inside polyethylene bag having a minimum thickness of 6 mils; or the box must be lined with strong paraffined paper or other authorized material, spec. 2L (§ 178.30 of this subchapter). Box hand-holes are not authorized.

(6) When such explosives are in combination cartridges, consisting of column of explosives with core of dynamite, they may be shipped when packed in outside boxes with 65 pounds as the maximum gross weight. The column of explosives must be completely inclosed in waterproofed cloth or strong waterproofed paper and must not exceed 6 inches in diameter, 20 inches in length, or gross weight of 25 pounds.

(7) Spec. 23G (§ 178.218 of this subchapter). Fiberboard boxes. Such explosives when packed in boxes consisting of more than one tube joined circumferentially are exempt from requirements of § 173.61 (f) and (g) or when packed in boxes consisting of one tube closed at the ends are exempt from requirements of § 173.61 (d) to (g) inclusive. The gross weight of boxes not to exceed 65 pounds.

(b) Boxes containing high explosives must be plainly marked on top and on one side or end, except those made in compliance with spec. 23G which must be marked on the side or end, and kegs, drums, or barrels containing high explosives must be marked on both ends

"HIGH EXPLOSIVES—DANGEROUS" in letter not less than $\frac{7}{16}$ inch in height

(c) [Reserved]

(d) Propellant explosives, class A must be packed in containers as prescribed in § 173.93. Each outside container must be plainly marked "PROPELLANT EXPLOSIVES, CLASS A".

§ 173.65 High explosives with no liquid explosive ingredient nor any chlorate.

(a) High explosives containing no liquid explosive ingredient nor any chlorate if their sensitiveness to percussion is not greater than that measured by the blow delivered by an 8-pound weight dropping from a distance of 7 inches on a compressed pellet of the explosive three-hundredths of an inch thick and two-tenths of an inch in diameter, confined rigidly between hard steel surfaces as in the standard Impact Testing Apparatus of the Bureau of Explosives, must be packed in cartridges, or in bags or metal containers in outside boxes, except that the requirement of packaging in cartridges, bags or metal containers does not apply to plastic-bonded explosives, but they must be packed and cushioned so as to prevent movement of individual pieces within the outside shipping container. They must be packed in cartridges when their sensitiveness is greater than the limit prescribed in this section. Such explosives when dry may be packed in strong sift-proof bags securely closed so as to prevent leakage therefrom or metal containers of capacity not exceeding 60 pounds. These explosives must be packed in outside containers complying with the following specifications:

(1) Spec. 14, 15A, or 16A (§§ 178.165, 178.168, or 178.185 of this subchapter). Wooden boxes.

NOTE 1: Wooden boxes, having inside metal containers which are tightly and securely closed, may be equipped with hand holes in each end which must be not more than one inch by four inches and centered laterally not nearer than $1\frac{1}{2}$ inches from top edge of end of box.

(2) Spec. 12H, 23F, or 23H (§ 178.209, § 178.214, or § 178.219 of this subchapter). Fiberboard boxes.

(3) [Reserved]

(4) Gross weight of wooden boxes not to exceed 140 pounds. Gross weight of fiberboard boxes not to exceed 65 pounds.

(5) When such explosives contain over 5 percent moisture, boxes must be lined with strong paraffined paper or other authorized

material, spec. 2L (§ 178.30 of this subchapter).

(6) When such explosives are in combination cartridges, consisting of column of explosives with core of dynamite, they may be shipped when packed in outside boxes with 65 pounds as the maximum gross weight. The column of explosives must be completely inclosed in water-proofed cloth or strong waterproofed paper and must not exceed 6 inches in diameter, 20 inches in length, or gross weight of 25 pounds.

(7) Spec. 23G (§ 178.218 of this subchapter) Fiberboard boxes. Such explosives when packed in boxes consisting of more than one tube joined circumferentially are exempt from requirements of § 173.61 (f) and (g) or when packed in boxes consisting of one tube closed at the ends are exempt from requirements of § 173.61 (d) to (g) inclusive. The gross weight of boxes not to exceed 65 pounds.

(b) Amatol consisting of 80 percent ammonium nitrate and 20 percent trinitrotoluene, ammonium picrate, nitroguanidine, nitrourea, urea nitrate, picric acid, tetryl, trinitroresorcinol, trinitrotoluene, pentolite, cyclotrimethylenetrinitramine (desensitized), and soda amatol, in dry condition, in addition to containers prescribed in paragraphs (a) (1) to (5) and (7) of this section, may be shipped in containers complying with the following specifications:

(1) Spec. 14, 15A, or 16A (§§ 178.165, 178.168, or 178.185 of this subchapter). Wooden boxes with strong paper or cloth bags of capacity not exceeding 50 pounds, packed with filling holes up.

(2) Spec. 21C (§ 178.224 of this subchapter). Fiber drums. Net weight not to exceed 200 pounds.

(c) Trinitrotoluene and pentolite, in dry condition, in addition to containers prescribed in paragraphs (a), (1) to (5) and (b) (1) and (2) of this section, may be shipped in specification containers as follows:

(1) Spec. 14, 15A, or 16A (§§ 178.165, 178.168, or 178.185 of this subchapter). Wooden boxes with strong paper or cloth bags of capacity not exceeding 100 pounds, packed with filling holes up.

(2) Spec. 14, 15A, or 16A (§§ 178.165, 178.168 or 178.185 of this subchapter). Wooden boxes with strong siftproof liners, spec. 2L (§ 178.30 of this subchapter).

(d) The following materials may be shipped dry, in quantities not exceeding 4

ounces in one outside package, as drugs, n.o.s., or medicines, n.o.s., without any other requirements when in securely closed bottles or jars cushioned to prevent breakage:

- (1) Ammonium picrate
- (2) Dipicrylamine
- (3) Dipicryl sulfide
- (4) Dinitrophenylhydrazine
- (5) Nitroguanidine
- (6) Picramide
- (7) Picric acid
- (8) Picryl chloride
- (9) Trinitroanisole
- (10) Trinitrobenzene
- (11) Trinitrobenzoic acid
- (12) Trinitro-m-cresol
- (13) Trinitronaphthalene
- (14) Trinitroresorcinol
- (15) Trinitrotoluene
- (16) Urea nitrate

(e) Ammonium picrate, cyclotrimethylenetrinitramine, pentaerythrite tetranitrate (desensitized), picric acid, trinitrobenzene, trinitrobenzoic acid, trinitroresorcinol, trinitrotoluene, or urea nitrate, when wet with not less than 10 pounds of water to each 90 pounds of dry material must be shipped in packagings as follows:

- (1) [Reserved]
- (2) (See § 173.192 for shipments of wet ammonium picrate, wet picric acid, wet trinitrobenzoic acid, and wet urea nitrate not in excess of 16 ounces and § 173.193 for shipments of wet picric acid, wet trinitrobenzoic acid, and wet urea nitrate not in excess of 25 pounds.) (See § 173.212 for shipments of wet trinitrobenzene and wet trinitrotoluene not in excess of 16 ounces.)

(3) Spec. 5B (§ 178.82 of this subchapter) metal barrels or drums or Spec. 21C (§ 178.224 of this subchapter) fiber drums. Authorized only for cyclotrimethylenetrinitramine wet with not less than 10 pounds of water to each 90 pounds of dry material in inside containers which must be bags made of at least 10-ounce cotton duck, rubber or rubberized cloth and securely closed. The dry weight of cyclotrimethylenetrinitramine in one metal barrel or drum must not exceed 300 pounds and not more than 225 pounds in fiber drums. These bags containing the cyclotrimethylenetrinitramine must then be placed in a rubber bag, rubberized cloth bag or bag made of suitable water-tight material which must be securely closed and then placed in the drum. If shipment of cyclotrimethylenetrinitramine is to take place at a time freezing weather is to be anticipated, it must be wet with a mixture of

denatured ethyl alcohol or other suitable anti-freeze and water of such proportions that freezing will not occur in transit.

(4) Specification 21C (§ 178.224 of this subchapter). Fiber drum with an inside polyethylene bag having 0.004 inch minimum thickness and liquid-tight closure. Net weight not to exceed 200 pounds. Authorized only for wet desensitized pentaerythrite tetranitrate.

(f) Amatol when cast or pressed in a block or column, in addition to the containers prescribed in paragraphs (a) (1) to (5) and (7) of this section, may be shipped in specification containers as follows:

(1) Spec. 13A (§ 178.141 of this subchapter). Metal drums not exceeding 90 pounds gross weight.

(g) Nitrocellulose must be packed in wooden boxes complying with specs. 14, 15A, or 16A (§§ 178.165, 178.168, or 178.185 of this subchapter), with inside packages which must be:

(1) Inside packages containing not more than 1 pound each of dry, uncompressed nitrocellulose, wrapped in strong paraffined paper or suitable sparkproof material. Completed outside package not to contain more than 10 pounds dry nitrocellulose.

(2) Inside packages containing compressed sticks or blocks of dry nitrocellulose wrapped in strong paraffined paper. Gross weight not to exceed 75 pounds.

(h) Shaped charges, commercial, having exposed lined conical cavities must have such cavities effectively filled; those having conical cavities that are covered shall be paired together with the cavities facing each other and with one or more pairs in a fiber tube, or so arranged that the conical cavities of the shaped charges at the ends of the column face toward the center of the tube. The shaped charges in the fiber tubes must fit snugly with no excess space and the fiber tubes containing the shaped charges must be packed snugly with no excess space in the outside containers. Other methods of packaging for devices of which shaped charges are a component part may be employed when approved by the Bureau of Explosives. Shaped charges, commercial, must be packed in specification containers as follows:

(1) Spec. 14, 15A, or 16A (§§ 178.165, 178.168 or 178.185 of this subchapter). Wooden boxes. Gross weight not to exceed 140 pounds.

(2) Spec. 12H, 23F, or 23H (§ 178.209.

§ 178.214, or § 178.219 of this subchapter). Fiberboard boxes. Gross weight not to exceed 65 pounds.

(3) Spec. 12B (§ 178.205 of this subchapter). Fiberboard boxes which must be manufactured of at least 275-pound strength (Mullen or Cady test) double-wall corrugated fiberboard and shall be provided with double-faced corrugated lining board (see § 178.205-15 of this subchapter) having minimum strength (Mullen or Cady test) of 200 pounds. Individual charges of explosives shall be packed in inside securely closed, waterproof plastic containers, or in securely closed waterproof fiberboard containers having metal ends. Gross weight not to exceed 65 pounds. Inside individual containers shall be separated by means of double-faced corrugated fiberboard partitions of material not less than 175-pound Mullen or Cady test.

(1) Cyclotrimethylenetrinitramine (desensitized) in pellet form, dry, in addition to provisions of paragraphs (a) and (b) of this section may be packed in specification containers as follows:

(1) Spec. 15A (§ 178.168 of this subchapter). Wooden boxes. For pellets $\frac{1}{4}$ inch or less in diameter; pellets must be packed in a slide-type fiber carton with perforated fillers. All openings of the fiber carton shall be securely closed with pressure-sensitive tape. Inside containers shall be cushioned with at least 2 inches of sawdust between inner containers and outside box. No inside container shall contain more than one-half pound net weight of explosive composition and not more than 10 pounds net weight of explosive composition shall be packed in one outside box.

(2) Spec. 15A (§ 178.168 of this subchapter). Wooden boxes. For pellets exceeding $\frac{1}{4}$ inch in diameter; pellets must be packed in a fiber tube with positive closures at both ends, which shall be packed in a fiber carton having not more than one-half pound net weight of explosive composition. Fiber carton shall be cushioned with not less than 2 inches of sawdust in the outside box. Not more than 10 pounds net weight of explosive composition shall be packed in one outside box.

(j) Boxes containing high explosives must be plainly marked on top and on one side or end, except those made in compliance with spec. 23G (§ 178.218 of this subchapter) which must be marked on the side or end, and kegs, drums, or barrels containing high explosives must be marked on both ends "HIGH EXPLO-

SIVES—DANGEROUS" in letters not less than $\frac{1}{16}$ inch in height. When space will not permit such marking on ends of kegs or drums, it may be applied to the side of the container. The tops of boxes, except those referred to in paragraph (a) (1) to (7) of this section, must be marked "THIS SIDE UP".

§ 173.66 **Blasting caps, blasting caps with safety fuse, blasting caps with metal clad mild detonating fuse, and electric blasting caps.**

(a) Blasting caps, blasting caps with safety fuse, blasting caps with metal clad mild detonating fuse, or electric blasting caps, in quantity of 1,000 or less, are classified as class C explosives. See § 173.103.

(b) The outside of all blasting caps and electric blasting caps must be free from fulminate or other explosive compositions.

(c) Blasting caps containing not to exceed 50 grains of explosive composition each must be placed in strong interior containers, in which they must fit snugly. When caps are loaded vertically in interior metal containers, they must be covered by suitable elastic material placed over the caps. Not more than 100 such blasting caps may be packed in a single container. All inside containers must then be packed snugly in polyethylene plastic bags which are not subject to static generation, cartons or wrappings made of paper or pasteboard.

(d) Not more than 5,000 blasting caps, not exceeding 50 grains of explosive composition each, packed in inner containers as prescribed in paragraph (c) of this section, must be packed in outside containers complying with the following specifications:

(1) Spec. 14, 15A, or 16A (§ 178.165, § 178.168, or § 178.185 of this subchapter). Wooden boxes (see § 173.67(a) (1) Note 1) or spec. 12H, 23F, or 23H (§ 178.209, § 178.214, or § 178.219 of this subchapter), fiberboard boxes, with inside containers which must be cartons or wrappings with inside containers as prescribed in paragraph (c) of this section, which must be separated from the outside box by at least one inch of tightly packed sawdust, excelsior, or equivalent cushioning material. Gross weight not to exceed 150 pounds.

(e) More than 5,000 blasting caps, not exceeding 50 grains of explosive composition each, packed in inner containers as prescribed in paragraph (c) of this section, must be packed in outside contain-

ers complying with the following specifications:

(1) Spec. 14, 15A, or 16A (§ 178.165, § 178.168, or § 178.185 of this subchapter). Wooden boxes (see § 173.67(a)(1) Note 1) or spec. 12H, 23F, or 23H (§ 178.209, § 178.214, or § 178.219 of this subchapter), fiberboard boxes, with inside containers which must be cartons or wrappings with inner containers as prescribed in paragraph (c) of this section, packed in an inside box made of sound lumber, a hermetically sealed metal box of metal not less than 30 gauge United States standard, or a sealed package made of 6-ply Sisalkraft Asphalt Laminated sheeting, or its equivalent; Asphalt Laminated sheeting shall consist of 2 plies of strong fibers, 2 plies of pliable asphalt, and 2 plies of protective cover. The minimum tensile strength shall be 20 pounds per inch width in each direction. The laminated sheet shall have a minimum water resistance of 24 hours and a maximum water permeability of 4 grams per square meter per 24 hours. The inside wooden box, metal box, or sealed package must be separated at all points from the outside box by at least one inch of tightly packed sawdust, excelsior, or equivalent cushioning material. Gross weight not to exceed 150 pounds.

(2) More than 20,000 blasting caps containing not to exceed 50 grains of explosive composition each, must not be placed in one outside package.

(f) Blasting caps containing in excess of 50 grains of explosive composition each must be packed in containers complying with the following specifications:

(1) Spec. 14, 15A, or 16A (§§ 178.165, 178.168, or 178.185 of this subchapter). Wooden boxes (see § 173.67 (a) (1), Note 1) with inside containers which must have strong interior containers, in which they must fit snugly. When caps are loaded vertically in interior metal containers, they must be covered by suitable elastic material placed over the caps. Not more than 10 such blasting caps may be packed in a single inside container. All inside containers must then be packed snugly in cartons or wrappings made of paper or pasteboard. The cartons or wrappings must be separated from outside box by at least 1 inch of tightly packed sawdust, excelsior, or equivalent cushioning material. Not more than 500 caps containing in excess of 50 grains of explosive composition each may be placed in one outside package. Gross weight not to

exceed 150 pounds.

(g) Electric blasting caps must be packed in containers complying with the following specifications:

(1) Spec. 14, 15A, or 16A (§§ 178.165, 178.168, or 178.185 of this subchapter).

Wooden boxes (see § 173.67(a)(1), Note 1) or spec. 12H, 23F, or 23H (§§ 178.209, 178.214, or 178.219 of this subchapter), fiberboard boxes, with inside containers which must be pasteboard cartons containing not more than 100 caps each, or pasteboard tube inclosing each cap with wires or with the wires wrapped around the tube. Gross weight of 103 pounds authorized for spec. 12H boxes when constructed of 350-pound test corrugated fiberboard in accordance with § 178.209-8(a)(3) of this subchapter. Gross weight of wooden boxes containing pasteboard cartons or caps with wires 30 feet or more in length in pasteboard tubes must not exceed 150 pounds, except for export shipment. Gross weight of wooden boxes containing caps with wires less than 30 feet in length in pasteboard tubes must not exceed 75 pounds.

(h) Each outside container must be plainly marked "(number) BLASTING CAPS—HANDLE CAREFULLY", or "(number) ELECTRIC BLASTING CAPS—HANDLE CAREFULLY", as the case may be.

NOTE 1: The number of caps must be shown in the marking.

§ 173.67 Blasting caps with safety fuse and blasting caps with metal clad mild detonating fuse.

(a) Ten or less of the interior containers of not more than 100 blasting caps each, containing not to exceed 50 grains of explosive composition each, packed as prescribed in § 173.66(c), in the same outside container with safety fuse or metal clad mild detonating fuse, must be shipped in containers complying with the following specifications:

(1) Spec. 14, 15A, or 16A (§ 178.165, § 178.168, or § 178.185 of this subchapter). Wooden boxes (see Note 1 of this paragraph) or spec. 12H, 23F, or 23H (§ 178.209, § 178.214, or § 178.219 of this subchapter), fiberboard boxes, with inside containers which must be cartons or wrappings with inner containers as prescribed in § 173.66(c), placed in the center of a coil of fuse and secured and cushioned therein to prevent movement therefrom. Gross weight not to exceed 150 pounds.

NOTE 1: Closing of outside boxes by nailing tops in place with uncoated nails, at not over 3-inch centers into ends, and at not over 6-inch centers into sides, is authorized. Sizes of these nails must be not less than the following:

3-penny into ends and sides not over $\frac{3}{4}$ inch thick.

4-penny into ends and sides over $\frac{3}{4}$ but not over $\frac{1}{2}$ inch thick.

5-penny into ends and sides over $\frac{1}{2}$ but not over $\frac{3}{4}$ inch thick.

6-penny into ends and sides over $\frac{3}{4}$ but not over $1\frac{1}{4}$ inch thick.

7-penny into ends and sides over $1\frac{1}{4}$ inch thick.

(b) Each outside container must be plainly marked "(number) BLASTING CAPS WITH SAFETY FUSE—HANDLE CAREFULLY" or "(number) BLASTING CAPS WITH METAL CLAD MILD DETONATING FUSE—HANDLE CAREFULLY," as the case may be.

§ 173.68 Detonating primers.

(a) Detonating primers must be packed in containers complying with the following specifications:

(1) Specification 14, 15A, or 16A (§§ 178.165, 178.168, 178.185 of this subchapter). Wooden boxes (see § 173.67(a)

(1) Note 1) or Specification 12H, 32F, or 23H (§§ 178.209, 178.214, 178.219 of this subchapter), fiberboard boxes, with inside containers which must be either polyethylene plastic bags not subject to static generation containing not more than 50 primers each or pasteboard cartons containing not more than 50 primers each, or pasteboard or plastic tube enclosing each primer with wires or pasteboard, wooden, metal or plastic tubes or spools with wires wrapped around the tube or spool. Gross weight of wooden boxes containing pasteboard cartons must not exceed 150 pounds, except for export shipment. Gross weight of wooden boxes containing pasteboard or plastic tube enclosing each primer with wires, or pasteboard, wooden, metal, or plastic tubes or spools with the wires wrapped around the tube or spool must not exceed 75 pounds.

(b) Each outside container must be plainly marked "DETONATING PRIMERS—HANDLE CAREFULLY".

§ 173.69 Detonating fuzes, Class A, with or without radioactive components, detonating fuze parts containing an explosive, boosters, bursters, or supplementary charges.

(a) Detonating fuzes, class A with or without radioactive components, detonating fuze parts containing an explosive, boosters, bursters, or supplementary charges, when shipped not assembled in projectiles, bombs, etc., must be packed and well secured in strong, tight wooden or metal boxes.

NOTE 1: A fuze with any radioactive component is also subject to the applicable provisions of §§ 173.389 through 173.399 for the radioactive material.

(b) The gross weight of one outside package containing detonating fuzes class A, must not exceed 190 pounds. Boosters, bursters and supplementary charges, without detonators, when shipped separately, must not exceed a gross weight of 300 pounds.

(c) Each outside package must be plainly marked "DETONATING FUZES CLASS A EXPLOSIVES—HANDLE CAREFULLY—DO NOT STORE OR LOAD WITH ANY HIGH EXPLOSIVES," or "DETONATING FUZES CLASS A EXPLOSIVES, RADIOACTIVE—HANDLE CAREFULLY—DO NOT STORE OR LOAD WITH ANY HIGH EXPLOSIVES," or "BOOSTERS (EXPLOSIVE)—HANDLE CAREFULLY," or "BURSTERS (EXPLOSIVE)—HANDLE CAREFULLY," or "SUPPLEMENTARY CHARGES (EXPLOSIVE)—HANDLE CAREFULLY," as the case may be.

§ 173.70 Diazodinitrophenol or lead mononitroresorcinate.

(a) The offering of diazodinitrophenol or lead mononitroresorcinate in a dry condition for transportation is forbidden except as a component of manufactured articles such as percussion caps, detonators, blasting caps, and exploders.

(b) Diazodinitrophenol or lead mononitroresorcinate must be packed wet with not less than 40 percent by weight of water in a specification container 5 or 5B (§§ 178.80, 178.82 of this subchapter) metal barrel or drum, with inside containers which must be bags made of at least 10-ounce cotton duck, rubber, or rubberized cloth. Each bag must be securely closed. The bags containing diazodinitrophenol or lead mononitroresorcinate must be placed in a rubber bag, rubberized cloth bag, or bag made of suitable watertight material and then placed in the barrel or drum. Any empty space in the outside bag must be filled with water and this bag securely closed. The dry weight of diazodinitrophenol in one outside container must not ex-

ceed 220 pounds and the dry weight of lead mononitroresorcinate in one outside container must not exceed 100 pounds.

(c) Sufficient outage in outside container must be allowed to prevent rupturing of container in freezing weather, or a mixture of denatured alcohol and water may be used to prevent freezing in transit.

(d) Each barrel or drum must be plainly marked "INITIATING EXPLOSIVE—DANGEROUS—DO NOT STORE OR LOAD WITH ANY HIGH EXPLOSIVE."

§ 173.71 Fulminate of mercury.

(a) The offering of fulminate of mercury in a dry condition for transportation is forbidden, except as a component of manufactured articles such as percussion caps, detonators, blasting caps, and exploders.

(b) Fulminate of mercury must be packed wet with not less than 25 percent by weight of water in a specification container 5 or 5B (§§ 178.80, 178.82 of this subchapter) metal barrel or drum, 17H (§ 178.118 of this subchapter) metal drum (single-trip), with an inside container which must be a bag made of 4-ounce duck. Inside the bag and over the fulminate, there must be placed a cap of the same fabric and of the same diameter as the bag. The bag must be securely tied and placed in a strong grain bag. The grain bag must also be securely tied. The bag and contents must be packed in the center of the metal barrel or drum and must be entirely surrounded by not less than three inches of well-packed sawdust saturated with water. The metal barrel or drum must be lined with a heavy, close-fitting, jute bag closed by secure sewing to prevent escape of sawdust. The barrel or drum must be inspected carefully and all leaks stopped. The dry weight of fulminate in one outside container must not exceed 150 pounds.

(c) If shipment of fulminate is to take place at a time that freezing weather is to be anticipated, a mixture of denatured ethyl alcohol and water of such proportions that freezing will not occur in transit must be used.

(d) Each barrel or drum must be plainly marked "INITIATING EXPLOSIVE—DANGEROUS—DO NOT STORE OR LOAD WITH ANY HIGH EXPLOSIVE."

§ 173.72 Guanyl nitrosamino guanylidene hydrazine.

(a) The offering of guanyl nitrosamino

guanylidene hydrazine in a dry condition for transportation is forbidden, except as a component of manufactured articles such as percussion caps, detonators, blasting caps, and exploders.

(b) Guanyl nitrosamino guanylidene hydrazine must be packed wet with not less than 30 percent by weight of water in a specification container 5 or 5B (§§ 178.80, 178.82 of this subchapter) metal barrel or drum, 17H (§ 178.118 of this subchapter) metal drum (single-trip), with an inside container which must be a bag made of 4-ounce duck. Inside the bag and over the guanyl nitrosamino guanylidene hydrazine, there must be placed a cap of the same fabric and of the same diameter as the bag. The bag must be securely tied and placed in a strong grain bag. This grain bag must also be securely tied. The bag and contents must be packed in the center of the metal barrel or drum, and must be entirely surrounded by not less than three inches of well-packed sawdust saturated with water. The metal barrel or drum must be lined with a heavy, close-fitting, jute bag closed by secure sewing to prevent escape of sawdust. The barrel or drum must be inspected carefully and all leaks stopped. The dry weight of guanyl nitrosamino guanylidene hydrazine in one outside container must not exceed 75 pounds.

(c) If shipment of guanyl nitrosamino guanylidene hydrazine is to take place at a time that freezing weather is to be anticipated, a mixture of denatured ethyl alcohol and water of such proportions that freezing will not occur in transit must be used.

(d) Each barrel or drum must be plainly marked "INITIATING EXPLOSIVE—DANGEROUS—DO NOT STORE OR LOAD WITH ANY HIGH EXPLOSIVE."

§ 173.73 Lead azide.

(a) The offering of lead azide in a dry condition for transportation is forbidden, except as a component of manufactured articles such as percussion caps, detonators, blasting caps, and exploders.

(b) Lead azide, dextrinated type, or otherwise prepared to effectively control grain size, must be packed wet with not less than 20 percent by weight of water in a specification container 5 or 5B (§§ 178.80, 178.82 of this subchapter) metal barrel or drum, 17H (§ 178.118 of this subchapter) metal drum (single-trip), with an inside container which must be a bag made of 4-ounce duck.

Inside the bag and over the lead azide, there must be placed a cap of the same fabric and of the same diameter as the bag. The bag must be securely tied and placed in a strong grain bag. This grain bag must also be securely tied. The bag and contents must be packed in the center of the metal barrel or drum, and must be entirely surrounded by not less than three inches of well-packed sawdust saturated with water. The metal barrel or drum must be lined with a heavy, close-fitting, jute bag closed by secure sewing to prevent escape of sawdust. The barrel or drum must be inspected carefully and all leaks stopped. The dry weight of lead azide in one container must not exceed 150 pounds.

(c) If shipment of lead azide is to take place at a time that freezing weather is to be anticipated, a mixture of denatured ethyl alcohol or other suitable antifreeze and water of such proportions that freezing will not occur in transit must be used.

(d) Each barrel or drum must be plainly marked "INITIATING EXPLOSIVE—DANGEROUS—DO NOT STORE OR LOAD WITH ANY HIGH EXPLOSIVE."

§ 173.74 Lead styphnate.

(a) The offering of lead styphnate (lead trinitroresorcinate) in a dry condition for transportation is forbidden, except as a component of manufactured articles such as percussion caps, detonators, blasting caps, and exploders.

(b) Lead styphnate (lead trinitroresorcinate) must be packed wet with not less than 20 percent by weight of water in specification container 5 or 5B (§§ 178.80, 178.82 of this subchapter) metal barrel or drum, 17H (§ 178.118 of this subchapter) metal drum (single-trip), with an inside container which must be a bag made of rubber cloth. The lead styphnate within this bag should be divided into a number of smaller packages. Inside the bag and over the lead styphnate, there must be placed a cap of the same fabric and of the same diameter as the bag. The bag and contents must be packed in the center of the metal barrel or drum, and must be entirely surrounded by not less than three inches of well-packed sawdust saturated with water. The metal barrel or drum must be lined with a heavy, close-fitting, jute bag closed by secure sewing to prevent escape of sawdust. The barrel or drum must be inspected carefully and all leaks stopped. The dry weight of lead styphnate in one outside container must not exceed 150

pounds.

(c) If shipment of lead styphnate is to take place at a time freezing weather is to be anticipated, it must be wet with a mixture of denatured ethyl alcohol and water of such proportions that freezing will not occur in transit.

(d) Each barrel or drum must be plainly marked "INITIATING EXPLOSIVE—DANGEROUS—DO NOT STORE OR LOAD WITH ANY HIGH EXPLOSIVE."

§ 173.75 Nitro mannite.

(a) The offering of nitro mannite in a dry condition for transportation is forbidden, except as a component of manufactured articles such as percussion caps, detonator, blasting caps, and exploders.

(b) Nitro mannite must be packed wet with not less than 40 percent by weight of water in a specification container 5 or 5B (§§ 178.80, 178.82 of this subchapter) metal barrel or drum, with inside container which must be bags made of at least 10-ounce cotton duck, rubber or rubberized cloth. Each bag must be securely closed. These bags containing the nitro mannite must then be placed in a rubber bag, rubberized cloth bag, or bag made of suitable watertight material and then placed in the barrel or drum. Any empty space in the outside bag must be filled with water and this bag securely closed. The dry weight of nitro mannite in one outside container must not exceed 100 pounds.

(1) Spec. 21C (§ 178.224 of this subchapter). Fiber drums not over 30 gallons capacity of at least nine-ply construction having, in addition, a sheet of steel having a minimum base box of 75 pounds, not less than 0.008 inch thick, wound between the fifth and sixth plies. The inside ply of kraft paper shall be laminated on each side with polyethylene to form a waterproof lining. The bottom head shall be of fiber, metal covered on the outside. Nitro mannite must be packed wet with not less than 40 percent by weight of water and shall be contained in at least two tightly sealed polyethylene bags of at least 0.004 inch thickness and this unit shall then be placed in a tightly closed polyethylene bag of at least 0.004 inch thickness and this assembly shall be placed within a 0.006 inch thickness polyethylene or other suitable plastic bag, completely filled with water and tightly closed. The 0.006 inch plastic bag shall be of such size as to completely fill the outside shipping container. The dry

weight of nitro mannite in one outside container must not exceed 100 pounds.

(c) Sufficient outage in outside container must be allowed to prevent rupturing of container in freezing weather, or a mixture of denatured ethyl alcohol and water may be used to prevent freezing in transit.

(d) Each barrel or drum must be plainly marked "INITIATING EXPLOSIVE—DANGEROUS—DO NOT STORE OR LOAD WITH ANY HIGH EXPLOSIVE."

§ 173.76 Nitrosoguanidine.

(a) The offering of nitrosoguanidine in a dry condition for transportation is forbidden except as a component of manufactured articles such as percussion caps, detonators, blasting caps, and exploders.

(b) Nitrosoguanidine must be packed wet with not less than 10 percent by weight of water in a specification container 5 or 5B (§§ 178.80, 178.82 of this subchapter) metal barrel or drum, 17H (§ 178.118 of this subchapter) metal drum (single-trip) with an inside container which must be a bag made of strong cloth, which must in turn be placed in the barrel or drum. The dry weight of nitrosoguanidine in one outside container must not exceed 75 pounds.

(c) Each barrel or drum must be plainly marked "INITIATING EXPLOSIVE—DANGEROUS—DO NOT STORE OR LOAD WITH ANY HIGH EXPLOSIVE."

§ 173.77 Pentaerythrite tetranitrate.

(a) The offering of pentaerythrite tetranitrate in a dry condition for transportation is forbidden, except as a component of manufactured articles such as percussion caps, detonators, blasting caps, and exploders.

(b) Pentaerythrite tetranitrate must be packed wet with not less than 40 percent by weight of water in a specification container 5 or 5B (§§ 178.80, 178.82 of this subchapter) metal barrel or drum, 17H (§ 178.118 of this subchapter) metal drum (single-trip) with inside containers which must be bags made of at least 10-ounce cotton duck, rubber, or rubberized cloth. Each bag must be securely closed. These bags containing pentaerythrite tetranitrate must then be placed in a rubber bag, rubberized cloth bag, or bag made of suitable watertight

material and then placed in the barrel or drum. Any empty space in the outside bag must be filled with water and this bag securely closed. The dry weight of pentaerythrite tetranitrate in one outside container must not exceed 300 pounds.

(c) Sufficient outage in outside container must be allowed to prevent rupturing of container in freezing weather, or a mixture of denatured ethyl alcohol or other suitable anti-freeze and water may be used to prevent freezing in transit.

(d) Each barrel or drum must be plainly marked "INITIATING EXPLOSIVE—DANGEROUS—DO NOT STORE OR LOAD WITH ANY HIGH EXPLOSIVE."

§ 173.78 Tetrazene.

(a) The offering of tetrazene (guanyl nitrosamino guanyl tetrazene) in a dry condition for transportation is forbidden, except as a component of manufactured articles such as percussion caps, detonators, blasting caps, and exploders.

(b) Tetrazene (guanyl nitrosamino guanyl tetrazene) must be packed wet with not less than 30 percent by weight of water in a specification container 5 or 5B (§§ 178.80, 178.82 of this subchapter) metal barrel or drum, 17H (§ 178.118 of this subchapter) metal drum (single-trip) with an inside container which must be a bag made of 4-ounce duck. Inside the bag and over the tetrazene, there must be placed a cap of the same fabric and of the same diameter as the bag. The bag must be securely tied and placed in a strong grain bag. This grain bag must also be securely tied. The bag and contents must be packed in the center of the metal barrel or drum, and must be entirely surrounded by not less than three inches of well-packed sawdust saturated with water. The metal barrel or drum must be lined with a heavy, close-fitting, jute bag closed by secure sewing to prevent escape of sawdust. The barrel or drum must be inspected carefully and all leaks stopped. The dry weight of tetrazene in one outside container must not exceed 75 pounds.

(c) If the shipment of tetrazene is to take place at a time that freezing weather is to be anticipated, it must be wet with a mixture of denatured ethyl alcohol and water of such proportions

that freezing will not occur in transit.

(d) Each barrel or drum must be plainly marked "INITIATING EXPLOSIVE—DANGEROUS—DO NOT STORE OR LOAD WITH ANY HIGH EXPLOSIVE."

§ 173.79 Jet thrust units (jato), Class A explosives; rocket motors, Class A explosives; igniters, jet thrust (jato), Class A explosives; and igniters, rocket motor, Class A explosives.

(a) Jet thrust units (jato), rocket motors, jet thrust (jato) igniters, and rocket motor igniters, which are Class A explosives must be packaged as follows:

(1) Specification 14, 15A, 15E, or 16A (§§ 178.165, 178.168, 178.172, 178.185 of this subchapter) wooden boxes, or wooden boxes, fiberboard lined.

(2) Wooden boxes, wooden crates, or other packagings of approved military specifications which comply with § 173.7 (a), or other packagings approved by the Bureau of Explosives.

(b) Jet thrust units, class A explosives or rocket motors, class A explosives, must not be shipped with igniters assembled therein unless shipped by, for, or to the Department of the Army, the Department of the Navy, or the Department of the Air Force.

(c) Jet thrust units class A explosives or rocket motors, class A explosives, may be packaged in the same outside packaging with their separately packaged igniters (or igniter components), class A, B, or C explosives only in packagings approved by the Bureau of Explosives or of approved military specifications complying with § 173.7(a).

(d) Each package must be plainly marked "JET THRUST UNITS, CLASS A EXPLOSIVES", "ROCKET MOTORS, CLASS A EXPLOSIVES", "IGNITERS, JET THRUST, CLASS A EXPLOSIVES", or "IGNITERS, ROCKET MOTOR, CLASS A EXPLOSIVES", as appropriate.

§ 173.80 Charged oil well jet perforating guns.

(a) Charged oil well jet perforating guns may be transported only by highway and only by private carriers engaged in oil well operations. When the total weight of the explosive contents of the shaped charges assembled to guns being transported in the motor vehicle does not exceed 20 pounds, these guns may be classed as Class C explosives. See § 173.110.

(b) Charged oil well jet perforating guns of the steel tube type must be packed without blasting caps, electric blasting caps, or other firing devices affixed to or installed in the guns and transported in specially constructed bodies of motor vehicles operated by private carriers engaged in oil well operations whose motor vehicles transporting such guns must have specially built racks or carrying cases designed and constructed so that the guns are held securely in place during transportation and are not subject to damage by contact, one to the other or other articles or materials carried on the vehicle. Shaped charges assembled in the steel tubes must be of the type described in § 173.53(h)(1), except that each shaped charge shall contain not over 4 ounces of high explosive and each shaped charge if not completely enclosed in glass or metal must be fully protected by a metal cover after installation in the gun.

(c) Charged oil well jet perforating guns of the metallic strip or tubular framework type must be packed without blasting caps, electric blasting caps, or other firing devices affixed to or installed in the guns and transported in specially constructed bodies of motor vehicles operated by private carriers engaged in oil well operations whose motor vehicles transporting such guns must have specially built racks or carrying cases designed and constructed so that the guns are held securely in place during transportation and are not subject to damage by contact, one to the other or other articles or materials carried on the vehicle. Shaped charges assembled in the metallic strips or tubular framework must be of the type described in § 173.53(h)(1), except that each shaped charge shall contain not over 4 ounces of high explosive and each shaped charge if not completely enclosed in glass or metal must be fully protected by a metal cover after installation in the gun.

(d) The charged oil well jet perforating guns described in paragraphs (b) and (c) of this section and the bodies of motor vehicles transporting such guns must be so designed and constructed so that the guns are held securely in place during transportation and are not subject to damage by contact, one to the other or other articles or materials carried on the vehicle. The assembled gun or guns packed as required by para-

graphs (b) or (c) of this section must not extend beyond the body of the vehicle and must be secured in the body of the motor vehicle in a fixed position so as to prevent movement relative to each other or in the body of the motor vehicle.

(e) Blasting caps, electric blasting caps, or other firing devices transported on any motor vehicle operated by private carriers engaged in oil well operations transporting charged oil well jet perforating guns shall be segregated; each kind from every other kind, and from jet perforating guns, tools or other supplies. Blasting caps, electric blasting caps, or other firing devices shall be carried in a container having individual pockets for each such device or in a fully enclosed steel container lined with nonsparking material. No more than two blasting caps, electric blasting caps, or other firing devices per gun shall be transported on the same motor vehicle transporting oil well jet perforating guns.

§ 173.81 - 173.85 [Reserved]

§ 173.86 New explosives, definitions; approval and notification.

(a) As used in this section, "new explosive" means an explosive compound, mixture or device, produced by a person who:

(1) Has not previously produced that explosive compound, mixture or device; or

(2) Has previously produced the explosive compound, mixture or device, but has made a change in the formulation, design, process or production equipment. An explosive compound, mixture or device will not be considered a "new explosive" if an agency listed in paragraph (b) of this section has determined and confirmed in writing to the Office of Hazardous Materials Operations (OHMO) that there are no significant differences in hazard characteristics relative to the explosive compound, mixture or device previously approved.

(b) No person may offer a new explosive for transportation unless it has been examined, classed, and approved by one of the following agencies:

(1) Bureau of Explosives;

(2) The U.S. Energy Research and Development Administration (ERDA) for new explosives made by, or under the direction or supervision of ERDA when tested in accordance with the Explosives

Hazard Classification Procedures contained in DOD TB 700-2 (May 19, 1967), or

(3) U.S. Army Material Development and Readiness Command (DRCFS), Naval Sea Systems Command (NAVSEA 04H), or HQUSAF (IGD/SEV) for new explosives made by, or under the direction or supervision of the Department of Defense when tested in accordance with the Explosives Hazard Classification procedures contained in DOD TB 700-2 (May 19, 1967), (NAVORDINST 8020.3 to 11A-1-47, DSAR 8220.1).

(c) Except as provided in paragraphs (d) and (e) of this section, each person who offers a new explosive for transportation, other than a new DOD explosive covered by a security classification, must file a copy of the approval for the new explosive accompanied by a supporting laboratory report of equivalent data with OHMO before offering the new explosive for transportation.

(d) Notwithstanding paragraph (b) of this section, any person may offer a sample of a new explosive that has not been approved for transportation by highway to a laboratory for examination and approval if:

(1) The new explosive has been assigned a tentative shipping description and class in writing by one of the agencies listed in paragraph (b) of this section;

(2) The sample consists of no more than five pounds of the new explosive;

(3) The new explosive is packaged as required in this part according to the tentative description and class assigned unless otherwise specified in writing by one of the agencies listed in paragraph (b) of this section, and

(4) The package is labeled as required by this subchapter and the following is marked on the package:

(i) The words "SAMPLE FOR LABORATORY EXAMINATION";

(ii) The net weight of the new explosive, and

(iii) The tentative shipping description.

(e) Notwithstanding paragraph (b) of this section, a manufacturer of a new explosive that has not been examined or approved may transport that new explosive from where it was produced to an explosive testing facility if:

(1) The new explosive is not a forbidden explosive or an initiating explosive according to this subchapter;

(2) The new explosive is a compound or mixture it must be described as high explosive or high explosive, liquid, as appropriate (other than when contained in a device) and packed, marked, labeled, and described on the shipping paper as required by this subchapter;

(3) The new explosive is a device it must be assigned a tentative description and class by the owner and packed, marked, labeled, and described on the shipping paper as required by this subchapter based on its tentative description and class;

(4) The new explosive is transported in a motor vehicle operated by the owner of the explosive, and

(5) The new explosive is accompanied by a person, in addition to the driver of the motor vehicle, who is qualified by training and experience to handle the explosive.

§ 173.37 Explosives in mixed packing.

(a) Unless specifically authorized by this subchapter, explosives must not be packed in the same outside package with each other or with other articles. Explosives, except blasting caps and other initiating explosives, in separate interior containers, may be shipped when packed in the same outside package of gross weight not exceeding 50 pounds, provided the weight of any interior package of explosives does not exceed 8 ounces, and provided the interior packages are so cushioned and protected as to insure their transportation without rupture or leakage of contents. The package must be marked and described with the name of the most dangerous explosive included such as "HIGH EXPLOSIVE" or "BLACK POWDER".

CLASS B EXPLOSIVES; DEFINITIONS

§ 173.88 Definition of class B explosives.

(a) Explosives, class B, are defined as those explosives which in general function by rapid combustion rather than detonation and include some explosive devices such as special fireworks, flash powders, some pyrotechnic signal devices and liquid or solid propellant explosives which include some smokeless powders. These explosives are further specifically described in paragraphs (b) to (g) of this section.

(b) Ammunition for cannon with empty projectiles, inert-loaded projec-

tiles, solid projectiles or without projectiles, or shell, and catapult charges exceeding 2 inches in diameter, is fixed ammunition assembled in a unit consisting of the cartridge case containing the propelling charge and primer with empty, inert-loaded, or solid projectiles, or without projectiles, which is fired from a cannon, mortar, gun, howitzer or recoilless rifle.

(c) Rocket ammunition is fixed ammunition which is fired from a tube, launcher, rails, trough, or other device as distinguished from cannon ammunition which is fired from a cannon, gun, or mortar. It consists of an igniter, a rocket motor, and empty projectile, inert-loaded projectile, or solid projectile.

(d) Special fireworks are manufactured articles designed primarily for the purpose of producing visible or audible pyrotechnic effects by combustion or explosion. (See § 173.100(r) for common fireworks.) Examples are toy torpedoes, railway torpedoes, some firecrackers and salutes, exhibition display pieces, aeroplane flares, illuminating projectiles, incendiary projectiles, incendiary bombs or incendiary grenades and smoke projectiles or smoke bombs fused or unfused and containing expelling charges but without bursting charges, flash powders in inner units not exceeding 2 ounces each, flash sheets in interior packages, flash powder or spreader cartridges containing not over 72 grains of flash powder each (see § 173.60 for shipments made as low explosives) and flash cartridges consisting of a paper cartridge shell, small-arms primer, and flash composition, not exceeding 180 grains all assembled in one piece. Fireworks must be in a finished state, exclusive of mere ornamentation, as supplied to the retail trade and must be so constructed and packed that loose pyrotechnic composition will not be present in packages in transportation.

(e) Jet thrust units (jato), class B explosives; rocket motors, class B explosives; igniters, jet thrust (jato), class B explosives; and igniters, rocket motors, class B explosives:

(1) Jet thrust units (jato), class B explosives, are metal cylinders containing a mixture of chemicals capable of burning rapidly and producing considerable pressure. Jet thrust units are designed to be ignited by an electric igniter. They are used to assist aeroplanes to take off.

(2) Rocket motor, class B explosives, is a device containing a propelling charge and consisting of one or more continuous type combustion unit(s), closed at one end (closure may be an igniter with a thrust plate) and with a nozzle(s) at the other end. The propelling charge consists of a mixture of chemicals and/or chemical compounds which when ignited is capable of burning rapidly and producing considerable pressure and which will not sustain a detonation. (The rocket motor carries its own solid oxidizer-fuel combination.) Rocket motors, class B explosives, should be nonpropulsive in shipment (see subdivisions (i) and (ii) of this subparagraph.) Rocket motors, class B explosives, are designed to be ignited by an electrically actuated device which may be an igniter, or by other means. They are used to propel and/or provide thrust for guided missiles, rockets, or spacecraft.

(i) A rocket motor to be considered "nonpropulsive" must be capable of unrestrained burning and will not move appreciably in any direction when ignited by any means. Blast deflectors, thrust neutralizers or other similar devices must be proven by test prior to authorization for use.

(ii) Rocket motors, class B explosives, may be shipped in a propulsive state only under conditions approved by the Department of Defense.

(3) Igniters, jet thrust (jato), class B explosives, and igniters, rocket motor, class B explosives, are devices consisting of an electrically operated or remotely controlled ignition element and a fast burning composition which functions by rapid burning rather than detonation, assembled in a unit for use in igniting the propelling charge of jet thrust units, rocket motors, or rocket engines.

(f) *Propellant explosives, class B.* Propellant explosives, class B, are solid or liquid chemicals or chemical mixtures which function by combustion. The combustion is controlled by composition, size, form of grain, or other chemical or mechanical means. Any propellant is class B which fails to detonate in five trials when tested (see Note 2) in the package in which it is offered for shipment. Propellant explosives, class B, include smokeless powder for small arms (see Note 4), smokeless powder for cannon, liquid monopropellant fuel (see Note 3), smokeless powder, or solid propellant explosives for rockets, jet thrust units, or

other devices. Black powder is not included in this classification and is defined specifically in § 173.53.

(g) Explosive power devices, CLASS B, are device designed to operate ejecting apparatus or other mechanisms by means of a propellant explosive, CLASS B, and differ from explosive power devices, CLASS C, in that they contain larger or more powerful propellants. The devices must not rupture on functioning and must be of a type approved by the Bureau of Explosives, except as otherwise provided in §§ 173.51(a) and 173.86(a).

Note 1: Fire extinguisher charges containing not to exceed 50 grains of propellant explosives per unit are exempt from the regulations in this chapter.

Note 2: In conducting the test, one propellant container shall be surrounded by inert loaded containers of the same weight, including one inert container placed on top of the propellant container. The propellant shall be ignited by means of a commercial electric squib placed within 4 inches of the bottom of the container. The presence of a crater and absence of flame shall be considered as evidences of detonation.

Note 3: A liquid monopropellant fuel is defined as any propellant in which the fuel and the oxidizer are physically or chemically combined in one form.

Note 4: Smokeless powder for small arms in quantities not exceeding 100 pounds net weight in one car or motor vehicle, except shipments by, for, or to the Department of the Army, Navy, or Air Force of the United States Government, shall be classed as a flammable solid for purposes of transportation when packaged in accordance with § 173.197a.

(h) Starter cartridges, jet engine, class B explosives consist of plastic and/or rubber cases, each containing a pressed cylindrical block of propellant explosive and having in the top of the case a small compartment that incloses an electrical squib, small amounts of black powder, and smokeless powder, which constitutes an igniter. The starter cartridge is used to activate a mechanical starter for jet engines.

(i) Rocket engine (liquid), class B explosives is a complete, self-contained rocket propulsion unit which contains an oxidizer and a fuel, each separated by an aluminum or stainless steel wall of not less than 0.250 inch thickness. Double walls are permitted. Pressurization of the propellant tanks is by use of a gas generator. The ignition source must be in an unarmed position for shipment. Rocket engines (liquid) are used to pro-

pel or provide thrust for rockets, missiles or spacecraft.

§ 173.89 Ammunition for cannon with empty projectiles, inert-loaded projectiles, solid projectiles, or without projectiles or shell.

(a) Ammunition for cannon with empty projectiles, inert-loaded projectiles or shell, must be well packed and properly secured in strong wooden or metal containers.

(b) Each outside package must be plainly marked "AMMUNITION FOR CANNON WITH EMPTY PROJECTILES", "AMMUNITION FOR CANNON WITH INERT-LOADED PROJECTILES", "AMMUNITION FOR CANNON WITH SOLID PROJECTILES", or "AMMUNITION FOR CANNON WITHOUT PROJECTILES", as the case may be.

§ 173.90 Rocket ammunition with empty, inert-loaded, or solid projectiles.

(a) Rocket ammunition with empty, inert-loaded, or solid projectiles must be well packed and properly secured in strong wooden or metal containers.

(b) Each package must be plainly marked "ROCKET AMMUNITION WITH EMPTY PROJECTILES," "ROCKET AMMUNITION WITH INERT-LOADED PROJECTILES," or "ROCKET AMMUNITION WITH SOLID PROJECTILES," as appropriate.

§ 173.91 Special fireworks.

(a) Special fireworks, except as otherwise authorized, must be securely packed in containers complying with the following specifications:

(1) [Reserved]

(2) Spec. 15A, 15B, 16A, or 19A (§§ 178.168, 178.169, 178.185, or 178.190 of this subchapter). Wooden boxes. Gross weight not to exceed 500 pounds.

(3) Spec. 12B (§ 178.205 of this subchapter). Fiberboard boxes. Gross weight not to exceed 65 pounds except as provided in subparagraph (5) of this paragraph. Not permitted for illuminating projectiles and aeroplane flares.

(4) Fireworks that can be exploded en masse, by dropping the completed shipping container from a height of six feet or by the impact of a rifle bullet, if found safe for transportation, may be shipped in accordance with the regulations in this Part applying to high explosives.

(5) Ship distress signals when packed in tight inside metal containers of not less than 24 gauge sheet iron or other metal of equal strength, securely closed by positive means (not friction) and of such design and so arranged as to completely fill the outside container, may be packed in spec. 12B (§ 178.205 of this subchapter) fiberboard boxes. Gross weight not to exceed 95 pounds when boxes are made in accordance with § 178.205-29 of this subchapter.

(6) Illuminating projectiles, incendiary projectiles, and smoke projectiles exceeding 90 pounds in weight each, or of not less than 4 1/2 inches in diameter, may be shipped without being boxed only by, for, or to the Departments of the Army, Navy, and Air Force of the U.S. Government when securely blocked and braced in accordance with methods prescribed by the cognizant military Departments and approved by the U.S. Department of Transportation.

(i) Illuminating projectiles, incendiary projectiles, and smoke projectiles less than 4 1/2 inches in diameter may be shipped without being boxed, when palletized, only by, for, or to the Departments of the Army, Navy, and Air Force of the U.S. Government when securely blocked and braced in accordance with methods prescribed by the cognizant military Departments and approved by the U.S. Department of Transportation.

(b) Flash or spreader cartridges not exceeding 72 grains of flash powder each must be packed in containers complying with the following specifications:

(1) Spec. 15A, 15B, 16A, or 19A (§§ 178.168, 178.169, 178.185, or 178.190 of this subchapter). Wooden boxes or spec 12B (§ 178.205 of this subchapter) fiberboard boxes, with inside containers which must be cartons or tin cans containing not over 6 cartridges and not to exceed 150 cartons or cans to an outer box.

(c) Flash cartridges consisting of a paper cartridge shell, small arms primer, and flash composition, not exceeding 180 grains each, all assembled in one piece ready for firing must be packed in con-

tainers complying with the following specifications:

(1) Spec. 15A, 15B, 16A, or 19A (§§ 178.168, 178.169, 178.185, or 178.190 of this subchapter). Wooden boxes, or spec. 12B (§ 178.205 of this subchapter) fiberboard boxes, with inside containers which must be cartons containing not to exceed 12 cartridges each and not more than 12 such cartons in one outside box.

(2) Flash cartridges, in quantity not exceeding 5 pounds, when in small interior wooden boxes, may be packed with nonexplosive, nonflammable or noncorrosive articles.

(d) Flash sheets must be packed in containers complying with the following specifications:

(1) Spec. 15A, 15B, 16A, or 19A (§§ 178.168, 178.169, 178.185, or 178.190 of this subchapter). Wooden boxes, or spec. 12B (§ 178.205 of this subchapter) fiberboard boxes, with inside containers which must be an inner package or envelope containing not more than 6 flash sheets and not more than one dozen inner envelopes or packages inclosed in each inner pasteboard box or carton. Gross weight of wooden box not to exceed 150 pounds. Gross weight of fiberboard box not to exceed 65 pounds.

(2) Flash sheets, in quantity not exceeding 5 pounds, when in small interior wooden boxes, may be packed with nonexplosive, nonflammable, or noncorrosive articles.

(e) Photographic flash powder must be packed in containers complying with the following specifications:

(1) Spec. 15A, 15B, 16A, or 19A (§§ 178.168, 178.169, 178.185, or 178.190 of this subchapter). Wooden boxes, or spec. 12B (§ 178.205 of this subchapter) fiberboard boxes, with inside containers which must be any inside container sufficiently strong to retain contents not exceeding 2 ounces each. If bottles are used, each bottle must be packed in a securely closed fiber mailing tube having metal ends. Not more than 4 dozen 2-ounce bottles may be packed in an outer wooden box. When packed in units not exceeding 1 ounce each without bottles in similar fiber mailing tubes and outer wooden boxes, the gross weight of one outside box must not exceed 150 pounds. Gross weight of fiberboard box not to exceed 65 pounds.

(2) Photographic flash powder, in quantity not exceeding 5 pounds, when in small interior wooden boxes, may be

packed with nonexplosive, nonflammable, or noncorrosive articles.

(f) Railway torpedoes (track torpedoes) must be packed in containers complying with the following specifications:

(1) Spec. 15A, 15B, 16A, 19A, or 19B (§§ 178.168, 178.169, 178.185, 178.190, or 178.191 of this subchapter). Wooden boxes. Net weight not to exceed 125 pounds.

(2) Spec. 12H, 23F, or 23H (§ 178.209, § 178.214, or § 178.219 of this subchapter). Fiberboard boxes. Gross weight not to exceed 65 pounds.

(3) Spec. 12B (§ 178.205 of this subchapter). Fiberboard boxes, with inside containers which must be cartons containing not to exceed one-half gross track torpedoes each. Gross weight of outside fiberboard box not to exceed 65 pounds.

(4) Spec. 12B (§ 178.205 of this subchapter). Fiberboard boxes without inside containers may be used for not more than 50 track torpedoes provided the smallest dimension of the box is not less than 6 inches.

(g) Toy torpedoes must be securely packed as prescribed in this section in containers complying with the following specifications:

(1) Spec. 15A, 15B, 16A, or 19A (§§ 178.168, 178.169, 178.185, or § 178.190 of this subchapter) wooden boxes, or spec. 12B (§ 178.205 of this subchapter) fiberboard boxes which must be constructed to comply with § 178.205-30 of this subchapter. Not more than 20 one-quarter gross cartons totalling not more than 5 gross of toy torpedoes are authorized per fiberboard box. Gross weight of fiberboard box must not exceed 35 pounds. Gross weight of wooden box must not exceed 65 pounds.

(2) Toy torpedoes of any kind must not be packed with other fireworks.

(3) Toy torpedoes containing a cap must be packed in sawdust, in inside paper or cardboard cartons. The size of the carton must be not less than 4 cubic inches for each grain of explosive.

(4) Toy torpedoes containing a mixture of potassium chlorate, black antimony and sulfur, must be packed in an inner container, containing not more than one-fourth gross. The capacity of this inner container must be not less than 105 cubic inches, and it must be divided into 12 equal compartments. All vacant space inside the container must then be filled with sawdust or fine shavings.

(5) The gross weight of a container of toy torpedoes must not exceed 65 pounds.

(h) Except as otherwise specified in this section the gross weight of one outside container of special fireworks must not exceed 500 pounds.

(i) **Marking.** Each outside container of special fireworks must be plainly marked in letters not less than $\frac{7}{16}$ inch in height "SPECIAL FIREWORKS—HANDLE CAREFULLY—KEEP FIRE AWAY", except that each outside container of railway torpedoes must be plainly marked in letters not less than $\frac{7}{16}$ inch in height "RAILWAY TORPEDOES—HANDLE CAREFULLY—KEEP FIRE AWAY".

(1) Outside containers of toy torpedoes must in addition be marked "TOY TORPEDOES".

§ 173.92 Jet thrust units (jato), CLASS B explosives; rocket motors, CLASS B explosives; igniters, jet thrust (jato), CLASS B explosives; igniters, rocket motors, CLASS B explosives; and starter cartridges, jet engine, CLASS B explosives.

(a) Class B explosives covered by this section must be packaged in outside packagings complying with the following specifications:

(1) Specification 14, 15A, 15E, or 16A (§§ 178.165, 178.168, 178.172, 178.185 of this subchapter) wooden boxes, or wooden boxes, fiberboard lined.

(2) Specification 15B (§ 178.169 of this subchapter) wooden boxes. Authorized only for igniters, jet thrust, class B explosives, or igniters, rocket motors, class B explosives.

(3) Specification 23F (§ 173.214 of this subchapter) fiberboard boxes. Authorized only for igniters, jet thrust, class B explosives; igniters, rocket motor, class B explosives; or starter cartridges, jet engine, class B explosives. Items must be packaged in tightly closed inside fiberboard boxes (at least 200-pound test (Mullen or Cady)) or metal containers. Starter cartridges, jet engine, must have igniter wires short-circuited when packed for shipment.

(4) Wooden boxes, wooden crates, or other packagings of approved military specification which comply with § 173.7

(a), or other packagings approved by the Bureau of Explosives.

(b) Jet thrust units, class B explosives, or rocket motors, class B explosives, must not be shipped with igniters assembled therein unless shipped by, for, or to the Department of the Army, the Department of the Navy, or the Department of the Air Force.

(c) Jet thrust units, class B explosives, or rocket motors, class B explosives, may be packaged in the same outside packaging with their separately packaged igniters (or igniter components), class A, B, or C explosives, only in packagings approved by the Bureau of Explosives or of approved military specifications complying with § 173.7(a).

(d) Each package must be plainly marked "JET THRUST UNITS, CLASS B EXPLOSIVES", "ROCKET MOTORS, CLASS B EXPLOSIVES", "IGNITERS, JET THRUST, CLASS B EXPLOSIVES", "IGNITERS, ROCKET MOTORS, CLASS B EXPLOSIVES", or "STARTER CARTRIDGES, JET ENGINE, CLASS B EXPLOSIVES" as appropriate.

§ 173.93 Propellant explosives (solid) for cannon, rockets, guided missiles, or other devices, and propellant explosives (liquid).

(a) Propellant explosives (solid) for cannon, rockets, guided missiles, or other devices, and propellant explosives (liquid) must be packed in containers complying with the following specifications:

(1) [Reserved]

(2) Spec. 13 (§ 178.140 of this subchapter). Metal kegs at least 8 inches long. Gross weight not to exceed 150 pounds.

(3) Bundles of metal kegs, spec. 13 (§ 178.140 of this subchapter), firmly tied together with rope and wrapped in strong burlap, canvas, or similar material, securely sewed and roped, are authorized. Net weight of propellant explosives must not exceed 100 pounds.

(4) Tight metal cases in tight wooden boxes free from loose knots and cracks or tight metal containers. Gross weight not to exceed 200 pounds.

(5) Spec. 14 or 15A (§§ 178.165 or 178.168 of this subchapter). Wooden boxes, metal-lined, spec. 2F (§ 178.25 of this subchapter). Gross weight not to exceed 200 pounds.

(6) Spec. 14 or 15A (§ 178.165 or § 178.168 of this subchapter) wooden boxes or spec. 23F or 23H (§ 178.214 or § 178.219 of this subchapter) fiberboard boxes, with inside containers which must be cloth or paper bags, of capacity not exceeding 25 pounds, net weight, each capable of withstanding, when filled to shipping content, at least two drops on end from a height of 4 feet, without breakage or sifting of contents. Outside container not to exceed more than 50 pounds, net weight.

(7) Spec. 14, 15A, 15B, or 15C (§§ 178.165, 178.168, 178.169, or § 178.170 of this subchapter) wooden boxes, or spec. 12B, 23F, or 23H (§§ 178.205, 178.214, or § 178.219 of this subchapter) fiberboard boxes, with inside containers which must be spec 13 metal kegs. Spec. 12B (§ 178.205 of this subchapter) fiberboard boxes shall contain not more than 6 metal kegs not over 5 pounds net weight each in one outside box. Gross weight not to exceed 200 pounds in wooden boxes or 65 pounds in fiberboard boxes.

(8) Spec. 14, 15A, 15B, or 15C (§§ 178.165, 178.168, 178.169, or 178.170 of this subchapter) wooden boxes, or spec. 12H, 23F, or 23H (§§ 178.209, 178.214, or 178.219 of this subchapter) fiberboard boxes, with inside containers which must be fiber or metal containers of not more than 1½ pounds capacity each. Gross weight not to exceed 200 pounds in wooden boxes or 65 pounds in fiberboard boxes.

(9) Spec. 14, 15A, 15B or 15C (§§ 178.165, 178.168, 178.169 or 178.170 of this subchapter) wooden boxes, or spec. 23F or 23H (§§ 178.214 or 178.219 of this subchapter) fiberboard boxes, with inside containers which must be not to exceed four metal containers, spec. 2A (§ 178.20 of this subchapter), of not more than 25 pounds each. Gross weight in fiberboard boxes not to exceed 35 pounds.

(10) Specification 21C (§ 178.224 of this subchapter). Fiber drum. Each drum having any wooden head must be provided with a strong, sift-proof liner. Net weight may not exceed 225 pounds.

(11) Spec. 14, 15A, or 16A (§§ 178.165, 178.168, or 178.185 of this subchapter). Wooden boxes, not lined, authorized only

for grains not less than 1-inch in diameter or 3 inches in length, provided such grains are tightly packed and are coated with a protective material. Gross weight not to exceed 200 pounds.

(12) Propellant explosives packed in any manner other than as specifically provided for in this paragraph must be in containers approved by the Bureau of Explosives.

(b) Propellant explosives (smokeless powder for cannon or small-arms) in water must be packed in containers complying with the following specifications:

(1) Spec. 5, 5A, 5B, 6A, 6B, or 6C (§§ 178.80, 178.81, 178.82, 178.97, 178.98, or 178.99 of this subchapter). Metal barrels or drums.

(2) [Reserved]

(3) Spec. 15A (§ 178.168 of this subchapter). Wooden boxes metal-lined, spec 2F (§ 178.25 of this subchapter).

(c) Igniters composed of black powder may be included in shipments of propellant explosives.

(d) Propellant explosives (unstable, condemned, or deteriorated smokeless powder for cannon or small arms) must be packed submerged in water in containers complying with the following specifications:

(1) Spec. 5, 5A, 5B, 6A, 6B, or 6C (§§ 178.80, 178.81, 178.82, 178.97, 178.98, or 178.99 of this subchapter). Metal barrels or drums.

(2) [Reserved]

(3) Spec. 15A (§ 178.168 of this subchapter). Wooden boxes, metal-lined, spec. 2F (§ 178.25 of this subchapter).

(e) Propellant explosives (liquid), must be packed in containers complying with the following specifications:

(1) Spec. 15A, 15B, or 15E (§§ 178.168, 178.169, or 178.172 of this subchapter). Wooden box or wooden box fiberboard lined, with inside polyethylene bottles having taped screw-cap closures, not over 1 gallon capacity each. Each bottle must be entirely contained within a polyethi-

one or other suitable plastic bag formed of material not less than 0.004 inch thickness, with ends securely closed. Each bottle in the plastic bag shall be enclosed in a tight metal container and be surrounded on all sides with at least 2 inches of incombustible cushioning material. Cans in the outside box must likewise be cushioned from each other and sides, top, and bottom of the container.

(2) Spec. 5B, 6A, 6B, 6C, 6D; also 17C or 17H (single-trip containers) (§§ 178.82, 178.97, 178.98, 178.99, 178.102, 178.115, or 178.118 of this subchapter). Metal barrel, drum, or cylindrical steel overpack, with inside spec. 2S (§ 178.35 of this subchapter) polyethylene container, packed inside a strong, tight metal drum securely closed, or with inside glass-lined aluminum carboy not over 12 gallons capacity. Inside steel drum or glass-lined aluminum carboy must be surrounded on all sides with at least 2 inches of incombustible absorbent cushioning material uniformly distributed. Polyethylene containers are authorized only for liquids that will not react dangerously with the plastic or result in container failure.

(3) Outage requirements. Containers must not be entirely filled. Sufficient interior space must be left vacant to prevent leakage or distortion of containers due to the expansion of the contents from increase of temperature during transit.

(4) Propellant explosives (liquid) packed in any manner other than as specifically provided for in this paragraph must be in containers approved by the Bureau of Explosives.

(f) Each outside container must be plainly marked "PROPELLANT EXPLOSIVES (LIQUID), CLASS B," "PROPELLANT EXPLOSIVES (SOLID), CLASS B," or "PROPELLANT EXPLOSIVES (SOLID), CLASS B, in WATER," as the case may be. There may be added such additional marking as "Smokeless Powder for Cannon" or "Smokeless Powder for Small Arms," as the case may be.

(g) Propellant explosives must be packaged as follows:

(1) Solids in tightly closed metal cans or fiber containers, not exceeding 1 pound each, or in inside metal cans or

fiber containers containing not more than one grain of propellant, not exceeding 5 pounds each, and liquids in polyethylene bottles compatible with contained liquid, with screw-cap closures taped, not exceeding 1 pound or 16 fluid ounces capacity each, packed in outside wooden box, spec. 15A, 15B, or 15C (§§ 178.168, 178.169, or 178.170 of this subchapter); or outside fiberboard box spec 12B, 23F, or 23H (§§ 178.205, 178.214, or 178.219 of this subchapter). Not more than 1,000 small-arms primers packed in inside containers as prescribed by § 173.107 may be included in one outside shipping container with solid propellant explosives. Inside containers must be packed so as to prevent movement within the outside container. Not more than 10 pounds of propellant explosives may be shipped in one outside container. Each outside container must be plainly marked "PROPELLANT EXPLOSIVES (LIQUID), CLASS B," or "PROPELLANT EXPLOSIVES (SOLID), CLASS B," or "PROPELLANT EXPLOSIVES, CLASS B, and SMALL-ARMS PRIMERS," as the case may be.

§ 173.94 Explosive power devices, Class B.

(a) Explosive power devices, class B, must not be shipped with igniters assembled therein unless shipped by, for, or to the Departments of the Army, Navy, and Air Force of the United States Government or unless of a type approved by the Bureau of Explosives. Explosive power devices, class B, must be packed in outside containers complying with the following specifications:

(1) Spec. 14, 15A, 15E, or 16A (§§ 178.165, 178.168, 178.172, or 178.185 of this subchapter). Wooden boxes or wooden boxes, fiberboard lined.

(2) Strong wooden or metal boxes or containers. Authorized only for shipments made by, for, or to the Departments of the Army, Navy, or Air Force of the United States Government.

(b) Explosive power devices, class B, packed in any other manner must be in containers of a type approved by the Bureau of Explosives.

(c) Each outside container must be plainly marked "EXPLOSIVE POWER DE-

VICES, CLASS B" and "HANDLE CAREFULLY—KEEP FIRE AWAY."

§ 173.95 Rocket engines (liquid), Class B explosives.

(a) Rocket engines (liquid), Class B explosives must be packaged as follows:

(1) Specification 14, 15A, 15E, or 16A (§§ 178.165, 178.168, 178.172, 178.185 of this subchapter) wooden boxes, or wooden boxes, fiberboard lined.

(2) Wooden boxes or metal packagings of approved military specification which comply with § 173.7(a), or other packagings approved by the Bureau of Explosives.

(b) Rocket engines (liquid), class B explosives, must not be shipped with igniters or initiators assembled therein unless shipped by, for, or to the Department of the Army, the Department of the Navy, or the Department of the Air Force, and only when authorized by the Department of Defense or by the Bureau of Explosives.

(c) Rocket engines (liquid), class B explosives, may be packed in the same outside packaging with separately packaged igniters, jet thrust, class B explosives when authorized by the Department of Defense or when packagings are approved by the Bureau of Explosives.

(d) Each package must be plainly marked "ROCKET ENGINES (LIQUID), CLASS B EXPLOSIVES."

§ 173.96 - 173.99 [Reserved]

CLASS C EXPLOSIVES; DEFINITIONS

§ 173.100 Definition of Class C explosives.

(a) Explosives, class C, are defined as certain types of manufactured articles which contain class A, or class B explosives, or both, as components but in restricted quantities, and certain types of fireworks. These explosives are further specifically described in this section.

(b) Small arms ammunition is fixed ammunition consisting of a metallic, plastic composition, or paper cartridge case, a primer, and a propelling charge, with or without bullet, projectile, shot, tear gas material, tracer components, or

incendiary compositions, or mixtures, and is further limited to the following:

(1) Ammunition designed to be fired from a pistol, revolver, rifle, or shotgun held by the hand or to the shoulder.

(2) Ammunition of caliber less than 20 millimeters with incendiary solid inert or empty projectiles (with or without tracers), designed to be fired from machine guns or cannons.

(3) Blank cartridges including canopy remover cartridges, starter cartridges, and seat ejector cartridges, containing not more than 500 grains of propellant powder, provided that such cartridges shall be incapable of functioning en masse as a result of the functioning of any single cartridge in the container or as a result of exposure to external flame.

(4) Twenty millimeter ammunition other than specified in § 173.53(q).

(c) Explosive cable cutters are used for cutting cables, etc. They consist of a metal device containing a knife-edged component which is propelled by a small charge of an explosive compound.

(d) Cordeau detonant fuse is a fuse containing a core of pentaerythrite tetranitrate or cyclotrimethylene-trinitramine not exceeding 400 grains per linear foot, overspun with tapes, yarns and plastics or waterproofing compounds. Wire counterling is permissible.

(e) Percussion fuzes, combination fuzes, and time fuzes are devices designed to ignite powder charges of ammunition or to initiate an intermediate charge (booster) in projectiles, bombs, etc. When such fuzes are assembled with booster charges they are properly described as "detonating fuzes" (see § 173.53(g)(2)).

(f) Tracer fuzes and tracers are devices which are attached to projectiles and contain a slow-burning composition to show the flight of projectiles at night.

(g) Cartridge bags, empty, with black powder igniters consist of empty bags having attached thereto an igniter composed of black powder. (See § 173.93 (b), (c), and (d) when shipped with propellant explosives.)

(h) Igniters consist of fiberboard, plastic, paper or metal tubes containing a small quantity of igniting compound which is ignited by the action of a primer, pull wire or scratch composition.

(i) Delay electric igniters consist of small metal, fiberboard, or pasteboard tubes containing a wire bridge in contact with a small quantity of ignition com-

pound. The ignition compound is in contact with or in close proximity to a short piece of safety fuse.

(j) Electric squibs consist of small tubes or blocks containing a small quantity of ignition compound in contact with a wire bridge.

(k) Fuse lighters and fuse igniters are small cylindrical hollow pasteboard or metal tubes containing an igniting composition in one end, the other end being open to permit it to be placed on safety fuse.

(l) Safety squibs are small paper tubes containing a small quantity of black powder. One end of each tube is usually twisted and tipped with sulfur.

(m) Instantaneous fuse is cotton yarn impregnated with meal powder. No restrictions other than packing in strong wooden boxes or barrels plainly marked "INSTANTANEOUS FUSE" are prescribed in this Part.

(n) Primers are devices used to ignite the powder charges of ammunition or the black powder bursting charges of projectiles. For small-arms ammunition the primers are "small-arm primers" or "percussion caps".

(o) Safety fuse, consisting of a core of black powder overspun with yarns, waterproofing compounds, and/or tapes must be packed in outside fiberboard boxes, wooden boxes, wooden barrels, bales, or metal containers, and must be described for shipping purposes as "SAFETY FUSE". No other restrictions apply in this Part.

(p) Toy plastic or paper caps for toy pistols in sheets, strips, rolls, or individual caps, must not contain more than an average of twenty-five hundredths of a grain of explosive composition per cap and must be packed in inside packages constructed of cardboard not less than 0.013 inch in thickness, metal not less than 0.008-inch in thickness, noncombustible plastic not less than 0.015 inch in thickness, or a composite blister package consisting of cardboard not less than 0.013 inch in thickness and noncombustible plastic not less than 0.006 inch in thickness, which shall provide a complete enclosure and the minimum dimensions of each side or end of such package shall be not less than $\frac{1}{8}$ inch in height. Unless greater weight of composition is approved by the Bureau of Explosives, the number of caps in these inside packages shall be limited so that not more than 10 grains of explosive composition shall be packed into one

cubic inch of space and not exceeding 17.5 grains of the explosive composition of toy caps shall be packed in any inside container. These inner containers must be packed in outside containers as specified in § 173.109.

(q) Explosive rivets, each containing not more than 375 milligrams of explosive composition, are exempt from specification packaging and labeling requirements when packed in pasteboard or other inside boxes in securely closed strong wooden boxes, fiberboard boxes or metal containers. Each outside container must be marked "EXPLOSIVE RIVETS". No other restrictions apply in this Part.

(r) Common fireworks are fireworks devices suitable for use by the public and designed primarily to produce visible effects by combustion. Some small devices designed to produce audible effects are also included in this class. The types, sizes and amount of pyrotechnic contents of these devices are limited as enumerated in this paragraph. No component, of any device listed in this paragraph, which produces or is intended to produce an audible effect shall contain pyrotechnic composition in excess of 2 grains in weight; nor shall such device or component, upon functioning, project or disperse any metal, glass or brittle plastic fragments. (Propelling or expelling charges consisting of a mixture of sulfur, charcoal, and saltpeter are not considered as designed to produce audible effects.) Any new device, not enumerated in this paragraph, must be approved by the Bureau of Explosives before being offered for transportation as Common Fireworks. Common fireworks must be in a finished state exclusive of mere ornamentation as supplied to the retail trade and must be so constructed and packed that loose pyrotechnic composition will not be present in packages in transportation. Fireworks, except articles defined in paragraphs (s) through (y) inclusive, of this section, other than common fireworks as defined in this paragraph, and those forbidden for transportation in § 173.51, are classed as Special Fireworks (see § 173.88(d)).

(1) Roman candles, not exceeding ten balls spaced uniformly in the tube, total pyrotechnic composition not to exceed twenty grams each in weight. The inside tube diameter shall not exceed $\frac{3}{4}$ inch.

(2) Sky rockets with sticks, total pyrotechnic composition not to exceed

twenty grams each in weight. The inside tube diameter shall not exceed $\frac{1}{2}$ inch. The rocket sticks must be securely fastened to the tubes.

(3) Helicopter type rockets, total pyrotechnic composition not to exceed twenty grams each in weight. The inside tube diameter shall not exceed $\frac{1}{2}$ inch.

(4) Cylindrical fountains, total pyrotechnic composition not to exceed seventy-five grams each in weight. The inside tube diameter shall not exceed $\frac{3}{4}$ inch.

(5) Cone fountains total pyrotechnic composition not to exceed fifty grams each in weight.

(6) Wheels, total pyrotechnic composition not to exceed sixty grams for each driver unit or two hundred and forty grams for each complete wheel. The inside tube diameter of driver units shall not exceed $\frac{1}{2}$ inch.

(7) Illuminating torches and colored fire in any form, total pyrotechnic composition not to exceed one hundred grams each in weight.

(8) Dipped sticks, the pyrotechnic composition of which contains any chlorate or perchlorate shall not exceed 5 grams. Sparklers, the composition of which does not exceed 100 grams each and which contain no magnesium or magnesium and a chlorate or perchlorate, are not subject to the regulations in this chapter.

(9) Mines and shells of which the mortar is an integral part, total pyrotechnic composition not to exceed forty grams each in weight.

(10) Firecrackers and salutes with casings, the external dimensions of which do not exceed one and one-half inches in length or one-quarter inch in diameter, total pyrotechnic composition not to exceed two grains each in weight.

(11) Novelties consisting of two or more devices enumerated in this paragraph when approved by the Bureau of Explosives.

(s) Igniter cord consists of textile yarns and/or a wire uniformly covered with a combustible chemical mixture, with or without additional textile or wire counterings, waterproofing or finishing coatings which, when ignited burns externally at various rates according to design. Igniter cord must be packed in strong, tight, outside fiber-board boxes or drums, wooden boxes or metal containers plainly marked "IGNITER CORD."

(t) Explosive auto alarms are tubular devices containing a small amount of explosive composition and igniting compound which is ignited by an electric spark. These devices must be so designed that they will neither burst nor cause external flame on functioning.

(u) Toy propellant devices and toy smoke devices consist of small paper or composition tubes or containers containing a small charge of slow burning propellant powder or smoke producing powder. These devices must be so designed that they will neither burst nor produce external flame on functioning and ignition elements, if attached, must be of a design approved by the Bureau of Explosives.

(v) Oil well cartridges are tubular devices each containing not more than 350 grains of propellant powder and having no ignition device or element. Cartridges must be constructed and packed so that they will be incapable of functioning en masse as a result of exposure to external flame.

(w) Actuating cartridges, explosive, fire extinguisher or valve consist of a small metal or fiber housing containing a small amount of initiating explosive and a propellant and are used to actuate valves on remotely controlled fire extinguishers or other apparatus.

(x) Cigarette loads, trick matches, and trick noise makers, explosive, must be of a type approved by the Bureau of Explosives and are described as follows:

(1) Cigarette loads consist of wooden pegs to which are affixed a small amount of explosive composition.

(2) Trick matches consist of book matches, strike anywhere matches, or strike-on-box matches which have small amounts of explosive or pyrotechnic composition affixed to the match stem just below the match head.

(3) Trick noise makers, explosive, consist of spheres containing a small amount of explosive composition.

(y) Smoke candles, smokepots, smoke grenades, smoke signals, signal flares, hand signal devices, and Very signal cartridges are devices designed to produce visible effects for signal purposes. These devices must contain no bursting charges and no more than 200 grams of pyrotechnic composition each (see note 1), exclusive of smoke composition (see note 2), unless greater weight of com-

position is approved by the Bureau of Explosives.

NOTE 1: Pyrotechnic compositions (other than smoke compositions) are defined as chemical mixtures which on burning and without explosion, produce visible or brilliant displays or bright lights.

NOTE 2: Pyrotechnic smoke compositions are defined as chemical smoke producing mixtures, which on ignition burn at a controlled rate, without the production of flame and without the build-up of internal pressure that would rupture or burst the end product.

(z) Explosive release devices consist of a rod or link fitted with means for mechanical attachment to other apparatus or equipment and containing a small electrically initiated explosive charge which will break the rod or link upon functioning. These devices must be so designed that they will not function other explosive devices in the package sympathetically.

(aa) Explosive power devices, class C, are devices designed to drive generators or mechanical apparatus by means of propellant explosives, class B. The devices consist of a housing with a contained propellant charge and an electric igniter or squib. The devices must be of a type approved by the Bureau of Explosives for this classification.

(bb) Detonating fuzes, class C explosives, are used in the military service to detonate high explosive bursting charges of projectiles, mines, bombs, torpedos, grenades, demolition charges, and safety and arming devices. They contain a detonator and a quantity of high explosives. Additionally they may be used by the military or commercial users to transmit a detonation between two or more devices. This type detonating fuze contains either an explosive train consisting of mild detonating fuse, metal clad, igniter fuse-metal clad or similar type fuses, and any combination of one or more boosters, detonators and high explosives in a total quantity not exceeding 25 grams of explosive composition. All detonating fuzes, class C explosives, must be made and packed so that they will not cause functioning of other fuzes, explosives, or other explosive devices if one of the fuzes detonates in a shipping container or in adjacent containers.

(cc) Mild detonating fuses, metal clad and flexible linear shaped charges, metal clad consists of a core containing not more than $2\frac{1}{2}$ grains of high explosive

composition per lineal foot, clad with metal either with or without a covering of tapes, yarns, plastics or waterproofing compounds. Mild detonating fuse, metal clad, and flexible linear shaped charges, metal clad, in lengths not over 26 feet and not exceeding 15 grains per lineal foot having the individual lengths separated from adjacent lengths so that mass propagation will not occur, may be shipped as class C explosives.

(dd) Igniter fuse-metal clad consists of a base metal tube with a core of explosive igniter composition in quantity not exceeding 20 grains per foot.

(ee) Starter cartridges, jet engine, CLASS C, consist of a metal, plastic, and/or rubber case, each containing a pressed cylindrical block of flammable solid material and having in the top of the case a small compartment that encloses an electric squib, small amount of black powder, and/or smokeless powder which constitute an igniter. The starter cartridge is used to activate a mechanical starter for jet engines and must be of a type approved by the Bureau of Explosives except as provided in § 173.51(a) and § 173.86(a).

(ff) "Cartridge, practice ammunition" means a metal cartridge case containing a primer, a propelling charge of not more than 500 grains of propellant powder, and a solid projectile or a projectile containing a smoke spotting charge.

§ 173.101 [Reserved]

§ 173.101a [Reserved]

§ 173.102 Explosive cable cutters; explosive power devices, class C; explosive release devices, or starter cartridges, jet engine, class C explosives.

(a) Explosive cable cutters, explosive power devices, class C, explosive release devices, or starter cartridges, jet engine, class C must be packed in specification containers as follows:

(1) Spec. 12H, 23F, or 23H (§§ 178.209, 178.214, or 178.219 of this chapter). Fiberboard boxes. Authorized gross weight not to exceed 65 pounds.

(2) In addition to specification containers prescribed in this section, explosive cable cutters, explosive power devices, class C, explosive release devices, or starter cartridges, jet engine, class C may be shipped when packed in strong wooden or metal boxes, or other containers approved by the Bureau of Explosives. Starter cartridges, jet engine,

must have igniter wires short-circuited when packed for shipment.

(b) Each package must be plainly marked "EXPLOSIVE CABLE CUTTERS"; "EXPLOSIVE POWER DEVICES, CLASS C"; "EXPLOSIVE RELEASE DEVICES", or "STARTER CARTRIDGES, JET ENGINE, CLASS C EXPLOSIVES", as appropriate, and "HANDLE CAREFULLY—KEEP FIRE AWAY."

§ 173.103 Blasting caps, blasting caps with safety fuse, blasting caps with metal clad mild detonating fuse, and electric blasting caps, not exceeding 1,000 caps.

(a) Blasting caps, blasting caps with safety fuse, blasting caps with metal clad mild detonating fuse, and electric blasting caps, in quantity not exceeding 1,000 caps, must be packed and marked as prescribed in §§ 173.66 and 173.67.

§ 173.104 Cordeau detonant fuse, mild detonating fuse, metal clad or flexible linear shaped charges, metal clad.

(a) Cordeau detonant fuse, mild detonating fuse, metal clad or flexible linear shaped charges, metal clad must not be packed in the same package with detonators or with any high explosive.

(b) Cordeau detonant fuse, mild detonating fuse, metal clad or flexible linear shaped charges, metal clad, must be packed in wooden or fiberboard boxes.

(c) Each outside container must be plainly marked "CORDEAU DETONANT FUSE—HANDLE CAREFULLY," "MILD DETONATING FUSE, METAL CLAD—HANDLE CAREFULLY" or "FLEXIBLE LINEAR SHAPED CHARGES, METAL CLAD—HANDLE CAREFULLY" as the case may be.

§ 173.105 Percussion, tracer, combination, time fuzes and tracers.

(a) Percussion, tracer, combination, time fuzes and tracers must be packed in strong, tight, outside wooden boxes or spec. 23F (§ 178.214 of this subchapter) fiberboard boxes, with special provision for securing individual packages of fuzes or tracers against movement in the box.

(b) The gross weight of one outside wooden box must not exceed 150 pounds, and the gross weight of one outside fiberboard box must not exceed 65 pounds.

(c) Each outside container must be plainly marked with proper descriptive

name and also "HANDLE CAREFULLY".

(d) No restrictions other than proper description, packing, and marking are prescribed in this part for the transportation of percussion, tracer, time, or combination fuzes, or tracers.

§ 173.106 Cartridge bags, empty, with black powder igniters, igniters, safety squibs, electric squibs, delay electric igniters, igniter fuse-metal clad, and fuse lighters or fuse igniters.

(a) Cartridge bags, empty, with black powder igniters, igniters, safety squibs, electric squibs, delay electric igniters, igniter fuse-metal clad, and fuse lighters or fuse igniters must be packed in strong fiberboard or wooden boxes or wooden or metal barrels or drums properly described and properly marked with the name of the article packed therein.

§ 173.107 Primers, and grenades, empty, primed.

(a) Primers (cannon and combination), and empty grenades, primed, must be packed in strong, tight, outside wooden boxes, except as otherwise provided herein, with special provision for securing individual packages against movement in the box.

(b) [Reserved]

(c) [Reserved]

(d) [Reserved]

(e) Small-arms primers may be included with propellant explosives (solid), CLASS B, in the same outside container as provided in § 173.93 (g) (1). The weight of the small-arms primers or percussion caps must not exceed 5 pounds in any such outside container.

(f) The gross weight of one outside package must not exceed 150 pounds.

(g) Each outside container must be plainly marked with proper descriptive name and also "HANDLE CAREFULLY".

(h) No restrictions other than proper shipping name, packing and marking are prescribed in this part for the transportation of cannon primers, combination primers, or empty grenades primed.

§ 173.108 Common fireworks, signal flares, hand signal devices, smoke signals, smoke candles, smoke grenades, smoke pots, and Very signal cartridges.

(a) Class C explosives covered by this section must, unless otherwise specifically provided for, be securely packed in packages complying with the following

specifications.

(1) [Reserved]

(2) Spec. 15A, 15B, 16A, or 19A (§§ 178.168, 178.169, 178.185, or 178.190 of this subchapter). Wooden boxes. Gross weight not to exceed 100 pounds, except gross weight of 500 pounds is authorized for Very signal cartridges only.

(3) Spec. 12B (§ 178.205 of this subchapter) Fiberboard boxes. Gross weight not to exceed 65 pounds.

(4) Firecrackers, Chinese, in addition to containers specified in subparagraphs (a) (2), and (3) of this section, may also be transported in the package in which they are imported, provided these packages consist of wooden boxes, or fiberboard boxes, spec. 12B (§ 178.205 of this subchapter), in good condition, completely covered with strong matting and do not weigh more than 100 pounds, gross.

(5) Fireworks, such as sparklers, with match tip or head, or similar ignition point or surface, must have each individual tip, head, or similar ignition point or surface entirely covered and securely protected against accidental contact or friction.

(6) Signal flares may be packed with nonexplosive or nonflammable articles provided the outside packages are marked as prescribed in this section.

(b) [Reserved]

(c) Except as otherwise specified herein the gross weight of one outside package containing common fireworks must not exceed 100 pounds.

(d) Each outside package must be plainly marked in letters not less than seven-sixteenths of an inch in height "Common Fireworks," "Signal Flares," "Hand Signal Devices," "Smoke Signals," "Smoke Candles," "Smoke Pots," "Smoke Grenades," or "Very Signal Cartridges," as appropriate, and with the additional words "Handle Carefully—Keep Fire Away."

§ 173.109 Toy caps.

(a) Toy caps must be packed in containers complying with the following specifications:

(1) Spec. 15A, 15B, 16A, or 19A (§§ 178.168, 178.169, 178.185, or 178.190 of this subchapter). Wooden boxes. Gross weight not to exceed 150 pounds.

(2) Spec. 12B (§ 178.205 of this subchapter). Fiberboard boxes. Gross weight not to exceed 65 pounds.

(3) Toy caps, in addition to containers specified in subparagraphs (1) and (2)

of this paragraph, may be transported in the package in which they are imported, provided the package consists of a wooden box, metal-lined, in good condition, and weighing not over 100 pounds gross. Inside packages must be as defined in § 173.100(p).

(b) Toy caps may be packed with non-explosive or nonflammable articles provided the outside containers are marked as prescribed herein.

(c) Toy paper caps of any kind must not be packed with fireworks.

(d) Each outside container must be plainly marked "TOY CAPS--HANDLE CAREFULLY".

§ 173.110 Charged oil well jet perforating guns, total explosive content in guns not exceeding 20 pounds per motor vehicle.

(a) Charged oil well jet perforating guns transported by motor vehicles operated by private carriers engaged in oil well operations in which the total weight of the explosive contents of shaped charges assembled to guns being transported does not exceed 20 pounds per such vehicle must be packed as prescribed in § 173.80 (b), (c), (d) and (e).

(b) Charged oil well jet perforating guns may be offered for transportation and transported only by private carrier by highway.

§ 173.111 Cigarette loads, explosive auto alarms, toy propellant devices, toy smoke devices, trick matches, and trick noise makers, explosive.

(a) Cigarette loads, explosive auto alarms, toy propellant devices, toy smoke devices, trick matches, and trick noise makers, explosive must be packed in specification containers as follows:

(1) Spec. 15A, 15B, 16A, or 19A (§ 178.168, § 178.169, § 178.185, or § 178.190 of this subchapter). Wooden boxes. Gross weight not to exceed 150 pounds.

(2) Spec. 12B (§ 178.205 of this subchapter). Fiberboard boxes. Gross weight not to exceed 65 pounds.

(3) Each outside container must be plainly marked with the proper descriptive name and "HANDLE CAREFULLY"

§ 173.112 Oil well cartridges.

(a) Oil well cartridges must be so packed that the explosive composition does not exceed 20 grains per cubic inch of space in the outside shipping container and must be in specification containers as follows:

(1) Spec. 15A, 15B, 16A, or 19A (§ 178.168, § 178.169, § 178.185, or § 178.190 of this subchapter). Wooden boxes. Gross weight not to exceed 150 pounds.

(2) Spec. 12B (§ 178.205 of this subchapter). Fiberboard boxes. Gross weight not to exceed 65 pounds.

(3) Each outside container must be plainly marked with the name "Oil Well Cartridge" and "HANDLE CAREFULLY".

§ 173.113 Detonating fuzes, class C explosives.

(a) Detonating fuzes, class C explosives, must be packed in specification containers as follows:

(1) Spec. 12H (§ 178.209 of this subchapter). Fiberboard boxes without liners with well secured inside pasteboard cartons.

(2) In addition to specification containers prescribed in this section, detonating fuzes, class C explosive, may be packed in well secured strong, tight outside wooden or metal boxes. The gross weight of the outside wooden or metal box must not exceed 190 pounds.

(b) Each outside package must be plainly marked "DETONATING FUZES, CLASS C EXPLOSIVES—HANDLE CAREFULLY".

§ 173.114 Actuating cartridges, explosive, fire extinguisher or valve.

(a) Actuating cartridges, explosive, fire extinguisher or valve must be packed in strong wooden or fiberboard boxes.

(b) Each outside container must be plainly marked "ACTUATING CARTRIDGES, EXPLOSIVE, FIRE EXTINGUISHER — HANDLE CAREFULLY" or "ACTUATING CARTRIDGES, EXPLOSIVE, VALVE—HANDLE CAREFULLY".

(c) When shipped as components with fire extinguisher or with valve and with not more than 2 cartridges for each extinguisher or valve, they are not subject to the requirements of this chapter.

Subpart D—Flammable, Combustible, and Pyrophoric Liquids; Definitions and Preparation

§ 173.115 Flammable, combustible, and pyrophoric liquids; definitions.

(a) *Flammable liquid.* (1) For the purposes of this subchapter a flammable liquid means any liquid having a flash point below 100° F. (37.8° C.), with the following exceptions:

(i) Any liquid meeting one of the

definitions specified in § 173.300;

(ii) Any mixture having one component or more with a flash point of 100° F. (37.8° C.) or higher, that makes up at least 99 percent of the total volume of the mixture;

(2) For the purposes of this subchapter, a distilled spirit of 140 proof or lower is considered to have a flash point no lower than 73° F.

(b) *Combustible liquid.* (1) For the purposes of this subchapter, a combustible liquid is defined as any liquid that does not meet the definition of any other classification specified in this subchapter and has a flash point at or above 100° F. (37.8° C.) and below 200° F. (93.3° C.) except any mixture having one component or more with a flash point at 200° F. (93.3° C.) or higher, that makes up at least 99 per cent of the total volume of the mixture.

(2) For the purposes of this subchapter, an aqueous solution containing 24 per cent or less alcohol by volume is considered to have a flash point no less than 100° F. (37.8° C.) if the remainder of the solution does not meet the definition of a hazardous material as defined in this subchapter.

(3) 200° F. (93.3° C.) is a limitation of the application of the regulations in this subchapter and should not be construed as indicating that liquids with higher flash points will not burn. Markings such as "NONFLAMMABLE" or "NONCOMBUSTIBLE" should not be used on a vehicle containing a material that has a flash point of 200° F. (93.3° C.) or higher.

(c) *Pyrophoric liquids.* (1) For the purposes of this subchapter, a pyrophoric liquid is any liquid that ignites spontaneously in dry or moist air at or below 130° F. (54.5° C.).

NOTE 1: The Bureau of Explosives is equipped to test samples of flammable liquids to determine whether or not they are pyrophoric.

(d) *Flash point.* (1) "Flash point" means the minimum temperature at which a liquid gives off vapor within a test vessel in sufficient concentration to form an ignitable mixture with air near the surface of the liquid and shall be determined as follows:

(i) For a homogeneous, single-phase, liquid having a viscosity less than 45 S.U.S. at 100° F. (37.8° C.) that does not form a surface film while under test, one

of the following test procedures shall be used:

(A) Standard Method of Test for Flash Point by Tag Closed Tester, (ASTM D56-70);

(B) Standard Method of Test for Flash Point of Aviation Turbine Fuels by Setaflash Closed Tester, (ASTM D3243-73) or

(C) Standard Methods of Test for Flash Point of Liquids by Setaflash Closed Tester, (ASTM D3278-73).

(ii) For a liquid other than one meeting all of the criteria of subparagraph (d) (1) (i) of this paragraph, one of the following test procedures shall be used:

(A) Standard Method of Test for Flash Point by Pensky-Martens Closed Tester, (ASTM D93-71). Alternate tests authorized in this standard may be used.

(B) Standard Method of Test for Flash Point of Aviation Turbine Fuels by Setaflash Closed Tester, (ASTM D3243-73), or

(C) Standard Methods of Test for Flash Point of Liquids by Setaflash Closed Tester, (ASTM D3278-73).

(2) For a liquid that is a mixture of compounds that have different volatility and flash points, its flash point shall be determined as specified in paragraph (d) (1) of this section, on the material in the form in which it is to be shipped. If it is determined by this test that the flash point is higher than 20° F. (-6.67° C.) a second test shall be made on a sample of the liquid evaporated from an open beaker (or similar container), under ambient pressure and temperature (20 to 25° C.) conditions, to 90 percent of its original volume or for a period of 4 hours, whichever comes first. The lower flash point of the two tests shall be the flash point of the material.

(3) For flash point determinations by Setaflash closed tester, the glass syringe specified need not be used as the method of measurement of the test sample if a minimum quantity of 2 milliliters is assured in the test cup.

(e) "S.U.S." means Saybolt Universal Seconds as determined by the Standard Method of Test for Saybolt Viscosity (ASTM D88-56) (reapproved 1968) and may be determined by use of the S.U.S. conversion tables specified in ASTM Method D2161-66 following determination of viscosity in accordance with the procedures specified in the Standard Method of Test for Viscosity of Trans-

parent and Opaque Liquids (ASTM D445-65).

(f) [Reserved]

(g) If experience or other data indicate that the hazard of a material is greater or less than indicated by the criteria specified in paragraphs (a), (b), and (c) of this section, the Department may revise its classification or make the material subject to the requirements of this subchapter.

§ 173.116 Outage.

(a) Outage for packings of flammable liquids offered for transportation, except as otherwise provided in this part, must be as prescribed in paragraphs (b) to (h) of this section.

(b) Packagings must not be completely filled. For packagings of a capacity of 110 gallons or less, sufficient outage must be provided so that the packaging will not be liquid full at 130° F. (55° C.).

(c) [Reserved]

(d) [Reserved]

(e) [Reserved]

(f) [Reserved]

(g) [Reserved]

The following coefficients of expansion per degree Fahrenheit, of the principal flammable liquids shall be used in determining outages:

Acetone.....	0.00085
Amyl acetate.....	.00068
Benzol (benzene).....	.00071
Carbon disulfide.....	.00070
Ether.....	.00098
Ethyl acetate.....	.00079
Ethyl (grain) alcohol.....	.00062
Methyl (wood) alcohol.....	.00072
Toluol (toluene).....	.00063
Gasoline or naphtha:	
50-55° A. P. I. ¹.....	.00055
55.1-60° A. P. I. ¹.....	.00060
60.1-65° A. P. I. ¹.....	.00065
65.1-70° A. P. I. ¹.....	.00070
70.1-75° A. P. I. ¹.....	.00075
75.1-80° A. P. I. ¹.....	.00080
80.1-85° A. P. I. ¹.....	.00085
85.1-90° A. P. I. ¹.....	.00090

¹ °A. P. I. (American Petroleum Institute), according to the following formula:

$$^{\circ}\text{A. P. I.} = \frac{141.5}{\text{specific gravity}} - 131.5$$

(h) No cargo tank or compartment thereof used for the transportation of any flammable liquid shall be liquid full. The vacant space (outage) in a cargo tank or compartment thereof used in the transportation of flammable liquids

shall be not less than 1 percent; sufficient space (outage) shall be left vacant in every case to prevent leakage from or distortion of such tank or compartment by expansion of the contents due to rise in temperature in transit.

§ 173.117 Closing and cushioning.

(a) All containers must be tightly and securely closed. Inside containers must be cushioned as prescribed, or in any case when necessary to prevent breakage or leakage.

§ 173.118 Limited quantities of flammable liquids.

(a) Limited quantities of flammable liquids that do not meet the definition of another hazard class in this subchapter and for which exceptions are permitted as noted by reference to this section in § 172.101 of this subchapter, are excepted from labeling and specification packaging requirements of this subchapter when packed according to the following paragraphs. In addition, shipments are not subject to Part 172 or Part 177 of this subchapter.

(1) In metal containers not over 1 quart capacity each, packed in strong outside containers,

(2) In containers having a capacity not over 1 pint or 16 ounces by weight each, packed in strong outside containers, or

(3) In inside containers having a rated capacity of one gallon or less when packed in strong outside containers. The provisions of this partial exemption apply only if the flash point of the material is 73° F. or higher and the flash point, or an indication that the flash point is 73° F. or higher is marked on the outside package.

(b) A flammable liquid that does not meet the definition of another hazard class and has a flash point of 73° F. or higher is not subject to the specification packaging requirements of this Part when in packagings of 110 gallons or less. The provisions of this paragraph apply only if the flash point, or an indication that its flash point is 73° F. or higher, is marked on the outside package.

(c) Alcoholic beverages (wine and distilled spirits as defined in 27 CFR 4.10 and 5.11) in containers having a rated capacity of one gallon or less are not subject to the requirements of this subchapter.

(d) Special exceptions for shipment of

certain flammable liquids in the ORM-D class are provided in Subpart N of this Part.

§ 173.118a Exceptions for combustible liquids.

(a) Unless otherwise stated for a specific material, the regulations in this subchapter do not apply to a material classed as a combustible liquid in a packaging having a rated capacity of 110 gallons or less.

(b) A combustible liquid in a portable tank or cargo tank is not subject to the requirements of this subchapter except those that pertain to:

- (1) Shipping papers, waybills, or other billing;
- (2) Marking and placarding of portable tank;
- (3) Placarding of motor vehicles;
- (4) [Reserved]
- (5) Reporting incidents as prescribed in § 171.15 of this subchapter.

§ 173.119 Flammable liquids not specifically provided for.

(a) *Flammable liquids with flash point 20° F. or below.* Flammable liquids with flash point 20° F. or below and having vapor pressure (Reid¹ test) not over 16 pounds per square inch, absolute, at 100° F., other than those for which special requirements are prescribed in this Part, must be prepared for shipment in specification containers of a design and constructed of materials that will not react dangerously with or be decomposed by the chemical packed therein as required in the following paragraphs (see paragraphs (c) to (i) of this section for high pressure liquids, paragraphs (j) to (l) of this section for viscous liquids, and paragraph (m) of this section for flammable liquids which are also oxidizers, corrosive liquids, poison B liquids, or organic peroxides and § 173.134 for flammable liquids that are also pyrophoric liquids):

(1) Specification 1A, 1C, or 1D (§§ 178.1, 178.3, 178.4 of this subchapter). Glass carboys, boxed or in barrels or kegs, capacity not over 5 gallons, except capacity not over 6.5 gallons, authorized for Spec. 1D.

¹ ASTM Test D323.

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(3) In inside containers having a rated capacity of one gallon or less when packed in strong outside containers. The provisions of this partial exemption apply only if the flash point of the material is 73° F. or higher and the flash point, or an indication that the flash point is 73° F. or higher is marked on the outside package.

(b) A flammable liquid that does not meet the definition of another hazard class and has a flash point of 73° F. or higher is not subject to the specification packaging requirements of this Part when in packagings of 110 gallons or less. The provisions of this paragraph apply only if the flash point, or an indication that its flash point is 73° F. or higher, is marked on the outside package.

(c) Alcoholic beverages (wine and distilled spirits as defined in 27 CFR 4.10 and 5.11) in containers having a rated capacity of one gallon or less are not subject to the requirements of this subchapter.

(d) Special exceptions for shipment of certain flammable liquids in the ORM-D class are provided in Subpart N of this Part.

§ 173.118a EXCEPTIONS FOR COMBUSTIBLE LIQUIDS.

(a) Unless otherwise stated for a specific material, the regulations in this subchapter do not apply to a material classed as a combustible liquid in a packaging having a rated capacity of 110 gallons or less, unless the combustible liquid is a hazardous substance, or a hazardous waste.

(b) A combustible liquid that is a hazardous substance or a hazardous waste in a packaging having a rated capacity of 110 gallons or less, and a combustible liquid in a portable tank or cargo tank is not subject to the requirements of this subchapter except those that pertain to:

- (1) Shipping papers, waybills, and hazardous waste manifests;
- (2) Marking of portable tanks and marking of packages having a rated capacity of 110 gallons or less that contain hazardous substances or hazardous wastes;
- (3) Display of identification numbers on portable tanks, cargo tanks, and tank car tanks;
- (4) Placarding of portable tanks, cargo tanks, and vehicles transporting tank car tanks;
- (5) Reporting incidents as prescribed in § 171.15 of this subchapter.

(Source: 7 Ill. Reg. 3486, effective April 2, 1983)

§ 173.119 FLAMMABLE LIQUIDS NOT SPECIFICALLY PROVIDED FOR.

(a) FLAMMABLE LIQUIDS WITH FLASH POINT 20° F. OR BELOW. Flammable liquids with flash point 20° F. or below and having vapor pressure (Reid¹ test) not over 16 pounds per square inch, absolute, at 100° F., other than those for which special requirements are prescribed in this Part, must be prepared for shipment in specification containers of a design and constructed of materials that will not react dangerously with or be decomposed by the chemical packed therein as required in the following paragraphs (see paragraphs (c) to (i) of this section for high pressure liquids, paragraphs (j) to (1) of this section for viscous liquids, and paragraph (m) of this section for flammable liquids which are also oxidizers, corrosive liquids, poison B liquids, or organic peroxides and § 173.134 for flammable liquids that are also pyrophoric liquids):

(1) Specs. 1A, 1D, or 1M (§§ 178.1, 178.4, 178.17 of this subchapter). Glass carboys, in boxes or expanded polystyrene packagings. Rated capacity may not exceed 5 gallons for spec. 1A.

(2) Specs. 5, 5A, 5B, 5C, or 5M (§§ 178.80, 178.81, 178.82, 178.83, or 178.90 of this subchapter). Metal barrels or drums, with openings not exceeding 2.3 inches in diameter.

(3) Spec. 17E (§ 178.116 of this subchapter). Metal drums (single-trip) with openings not over 2.3 inches in diameter. Drums with a marked capacity of more than 5 gallons but not more than 30 gallons must be constructed of 19 gauge body and head sheets. Drums with a marked capacity in excess of 30 gallons must be constructed of 18 gauge body and head sheets.

(4) Spec. 17C (§ 178.115 of this subchapter). Metal drums (single-trip), with openings not exceeding 2.3 inches in diameter.

(5) (Reserved)

(6) (Reserved)

¹ ASTM Test D323.

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(7) Spec. 12B (§ 178.205 of this subchapter). Fiberboard boxes with inside containers which must be glass or earthenware, not over 1 quart each; metal cans not over 1 gallon each.

NOTE 1: Spec. 12B fiberboard boxes (§ 178.205-26 (a) of this subchapter), with one inside rectangular metal can, spec. 2F (§ 178.25 of this subchapter) not to exceed 5 gallons capacity, are authorized for gasoline only. Gross weight of completed package not over 65 pounds.

(8) Specs. 15A, 15B, 15C, 16A, 19A, or 19B (§§ 178.168, 178.169, 178.170, 178.185, 178.190, or 178.191 of this subchapter). Wooden boxes with inside containers which must be metal pails, kits, or cans, not over 10 gallons each or inside glass or earthenware containers not over 1 gallon each, except that glass or earthenware containers up to 3 gallons each are authorized when only one inside container is packed in each outside container.

(9) Specs. 21C, 22A or 22B (§§ 178.224, 178.196 or 178.197 of this subchapter). Fiber drums and plywood drums with a single inside glass, earthenware, or metal container of not over one gallon capacity in each drum. Inside container must be so cushioned at top, sides, and bottom, as to prevent breakage or leakage in transit.

(10) Specs. 42B, 42C, or 42H (§§ 178.107, 178.108, or 178.112 of this subchapter). Aluminum barrels or drums.

(11) Cylinders as prescribed for any compressed gas, except acetylene.

(12) Specs. 106A500X, 106A800XNC, 106A800NCI,* 110A500W, (§§ 179.300, 179.301 of this subchapter). Tank car tanks.

(13) (Reserved)

(14) Spec. 15X (§ 178.181 of this subchapter). Wooden boxes with inside metal containers. For shipment by common carriers by water to noncontiguous territories or possessions of the United States and foreign countries; shipments from inland points in the United States which are consigned to such destinations are authorized to be transported to ship side in truckload lots only.

(15) Spec. 17X (§ 178.119 of this subchapter). Metal drums (single-trip). For countries; shipments from inland points in the United States which are consigned to such destinations are authorized to be transported to ship side in truckload lots only.

(16) (Reserved)

(17) Specs. MC 300, MC 301, MC 302, MC 303, MC 304, MC 305, MC 306, MC 307, MC 330³, or MC 331³ (§§ 178.321, 178.322, 178.323, 178.324, 178.325, 178.326, 178.340, 178.341, 178.342, 178.336, 178.337). Tank motor vehicles. Bottom outlets on spec. MC 304 cargo tanks must be equipped with valves conforming with § 178.342-5 (a). Bottom outlets on specs. MC 330 and MC 331 cargo tanks must be equipped with valves conforming with § 178.337-11(c).

(18) (Reserved)

(19) Spec. 5L (§ 178.89 of this subchapter). Metal barrels or drums for gasoline shipments offered by or consigned to the Departments of the Army, Navy, and Air Force of the United States Government or Allies. Use of this container will be permitted because of the present emergency and until further order of the Department.

(20) Spec. 12D (§ 178.207 of this subchapter). Fiberboard boxes with inside containers which must be glass or earthenware not over one gallon each; authorized for not more than 75 pounds gross weight; not to contain more than 4 such inside containers if their capacity is greater than 5 pints each. Use of this container will be permitted because of the present emergency and until further order of the Department.

³ In addition to other requirements of this section, necessary interior cleaning of the tanks must be performed between changes in lading. Safety relief devices must be in accordance with spec. MC 331 (§ 178.337).

* Use of existing tank cars authorized, but new construction not authorized.

(2) Spec. 5, 5A, 5B, 5C, or 5M (§§ 178.80, 178.81, 178.82, 178.83, or 178.90 of this subchapter). Metal barrels or drums, with openings not exceeding 2.3 inches in diameter.

(3) Specification 17E (§ 178.116 of this subchapter). Metal drums (single-trip) with openings not over 2.3 inches in diameter. Drums with a marked capacity of more than 5 gallons but not more than 30 gallons must be constructed of 19-gauge body and head sheets. Drums with a marked capacity in excess of 30 gallons must be constructed of 18-gauge body and head sheets.

(4) Spec. 17C (§ 178.115 of this subchapter). Metal drums (single-trip), with openings not exceeding 2.3 inches in diameter.

(5) [Reserved]

(6) [Reserved]

(7) Spec. 12B (§ 178.205 of this subchapter). Fiberboard boxes with inside containers which must be glass or earthenware, not over 1 quart each; metal cans not over 1 gallon each.

NOTE 1: Spec. 12B fiberboard boxes (§ 178.205-26(a) of this subchapter), with one inside rectangular metal can, spec. 2F (§ 178.25 of this subchapter) not to exceed 5 gallons capacity, are authorized for gasoline only. Gross weight of completed package not over 65 pounds.

(8) Spec. 15A, 15B, 15C, 16A, 19A, or 19B (§§ 178.168, 178.169, 178.170, 178.185, 178.190, or 178.191 of this subchapter). Wooden boxes with inside containers which must be metal pails, kits, or cans, not over 10 gallons each or inside glass or earthenware containers no over 1 gallon each, except that glass or earthenware containers up to 3 gallons each are authorized when only one inside container is packed in each outside container.

(9) Spec. 21C, 22A or 22B (§ 178.224, § 178.196 or § 178.197 of this subchapter). Fiber drums and plywood drums with a single inside glass, earthenware, or metal container of not over one gallon capacity in each drum. Inside container must be so cushioned at top, sides, and bottom, as to prevent breakage or leakage in transit.

(10) Spec. 42B, 42C, or 42H (§ 178.107, 178.108, or 178.112 of this subchapter). Aluminum barrels or drums.

(11) Cylinders as prescribed for any compressed gas, except acetylene.

(12) Specification 106A500X, 106A800-XNC, 106A800NCI,* 110A500W, (179.300, 179.301 of this subchapter). Tank car tanks.

(13) [Reserved]

(14) Spec. 15X (§ 178.181 of this subchapter). Wooden boxes with inside metal containers. For shipment by common carriers by water to noncontiguous territories or possessions of the United States and foreign countries; shipments from inland points in the United States which are consigned to such destinations are authorized to be transported to ship side in truckload lots only.

(15) Spec. 17X (§ 178.119 of this subchapter). Metal drums (single-trip). For countries; shipments from inland points in the United States which are consigned to such destinations are authorized to be transported to ship side in truckload lots only.

(16) [Reserved]

(17) Specification MC 300, MC 301, MC 302, MC 303, MC 304, MC 305, MC 306, MC 307, MC 330,³ or MC 331³ (§§ 178.340, 178.341, 178.342, 178.337). Tank motor vehicles. Bottom outlets on specification MC 304 cargo tanks must be equipped with valves conforming with § 178.342-5(a). Bottom outlets on specifications MC 330 and MC 331 cargo tanks must be equipped with valves conforming with § 178.337-11(c).

(18) [Reserved]

(19) Spec. 5L (§ 178.89 of this subchapter). Metal barrels or drums for gasoline shipments offered by or consigned to the Departments of the Army, Navy, and Air Force of the United States Government or Allies. Use of this container will be permitted because of the present emergency and until further order of the Department.

(20) Spec. 12D (§ 178.207 of this subchapter). Fiberboard boxes with inside containers which must be glass or earthenware not over one gallon each; authorized for not more than 75 pounds gross

³ In addition to other requirements of this section, necessary interior cleaning of the tanks must be performed between changes in lading. Safety relief devices must be in accordance with specification MC 331 (§ 178.337).

*Use of existing tank cars authorized, but new construction not authorized.

weight; not to contain more than 4 such inside containers if their capacity is greater than 5 pints each. Use of this container will be permitted because of the present emergency and until further order of the Department.

(21) Gasoline samples in boxes of metal not lighter than 20 gauge, United States standard, having hinged cover securely closed, and containing not more than 5 inside rectangular metal cans with screw cap closure, each having a capacity not to exceed $\frac{1}{2}$ gallon, may be shipped when consigned to state laboratories for examination.

(22) Specification 17H or 37A (§§ 178.118 and 178.131 of this subchapter). Metal drums with inside glass packagings not over 9 pints capacity each. Inside containers may contain biological materials if these materials are not etiologic agents, except that etiologic agents exempt by § 173.386(d) are authorized.

(23) Spec. 12A (§ 178.210 of this subchapter). Fiberboard boxes, with inside glass bottles not over 1 gallon capacity each. Not more than four inside containers exceeding 5 pints capacity each shall be packed in the outside container. Shipper must have established that the completed package meets test requirement prescribed by § 178.210-10 of this subchapter.

(24) Spec. 6D (§ 178.102 of this subchapter). Cylindrical steel overpack with inside spec. 2S (§ 178.35 of this subchapter) polyethylene container.

(25) Spec. 51 (§ 178.245 of this subchapter). Portable tanks.

(26) Specification 57 (§ 178.253 of this subchapter). Portable tanks.

(b) *Flammable liquids with flash points above 20° F. to 73° F.* Flammable liquids with flash points above 20° F. to 73° F. and having vapor pressure (Reid¹ test) not over 16 pounds per square inch, absolute, at 100° F. other than those for which special requirements are prescribed in this Part, must be packaged in packagings of a design and constructed of materials that will not react dangerously with or be decomposed by the chemical packed therein as follows (see paragraphs (c) through (i) of this section for high-pressure liquids and paragraph (m) of this section for flammable

liquids which are also oxidizers, poison B liquids, organic peroxides or corrosive liquids):

(1) Containers as specified in paragraph (a) of this section, except that openings greater than 2.3 inches in diameter in barrels and drums are authorized when permitted by the specification, and also the following:

(2) Spec. 17E or 17H (§§ 178.116 or 178.118 of this subchapter). Metal drums (single-trip).

(3) Specification 10B (§ 178.156 of this subchapter). Wooden barrels or kegs. Authorized only for alcohol and alcohol-water-mixtures.

NOTE 1: Because of the present emergency and until further order of the Department, wooden whiskey barrels, properly recoopered, which comply with all the provisions of spec. 10B (§ 178.156 of this subchapter), are also authorized. Marking is required on the head of each container, by the reconditioner, by hot branding or legible stenciling, as follows: DOT-10B.

Name or symbol (letters) of reconditioner: this must be registered with the Bureau of Explosives and located just above, below, or following the mark DOT-10B.

Size of marking (minimum) $\frac{3}{4}$ inch high.

(4) Spec. 12B (§ 178.205 of this subchapter). Fiberboard boxes with inside containers which must be glass, earthenware, polyethylene (bags are not authorized), or metal, not over 1 gallon each. Packages containing inside glass or earthenware containers must not contain more than 4 such inside containers if their capacity is greater than 5 pints each. Polyethylene containers are authorized only for materials that will not react with or cause decomposition of the plastic.

NOTE 1: Because of the present emergency and until further order of the Department, fiberboard boxes, spec. 12B (§ 178.205-26(a) of this subchapter), with one inside rectangular metal can, spec. 2F (§ 178.25 of this subchapter), not to exceed 5 gallons capacity, are authorized. Gross weight of completed package not over 65 pounds.

(5) Spec. 12E (§ 178.208 of this subchapter). Fiberboard box with 1 or 2 rectangular metal inside containers of not over 5 gallons capacity each.

(6) Spec. 6K (§ 178.101 of this subchapter). Metal barrels or drums which must be constructed of Type 304 stainless steel, having heads with minimum convexity of $\frac{3}{8}$ inch welded to the body, and be equipped at both heads with 12

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gauge chime reinforcements. Body seams shall be welded. Drums shall be equipped with I-bar rolling hoops.

(7) Specification 37P (§ 178.133 of this subchapter). Steel drums with polyethylene liner (nonreusable container). Authorized only for materials that will not react with polyethylene and result in container failure.

(8) Specification 6D or 37M (nonreusable container) (§§ 178.102, 178.134 of this subchapter). Cylindrical steel overpack with an inside specification 2S or 2SL (§§ 178.35, 178.35a of this subchapter) polyethylene container. Authorized only for materials that will not react with polyethylene and result in container failure.

(9) Spec. 21P (§ 178.225 of this subchapter). Fiber drum overpack with inside spec. 2S or 2SL (§ 178.35 or 178.35a of this subchapter) polyethylene container. Authorized only for materials that will not react with polyethylene and result in container failure.

(10) Specification 37D (§ 178.137 of this subchapter). Nonreusable steel drum authorized only for a commodity not exceeding 10 pounds per gallon.

(c) *Flammable liquids for which other special packing requirements are not prescribed.* Flammable liquids for which other special packing requirements are not prescribed in this Part, must be shipped, depending upon their Reid¹ vapor pressures as prescribed in paragraphs (d) to (i) of this section.

(d) *When the vapor pressure does not exceed 16 pounds per square inch, absolute, at 100° F.* When the vapor pressure does not exceed 16 pounds per square inch, absolute, at 100° F., flammable liquids must be packed as prescribed in paragraphs (a) and (b) of this section.

(e) *When the vapor pressure exceeds 16 pounds per square inch, absolute, at 100° F.* When the vapor pressure exceeds 16 pounds per square inch, absolute, at 100° F., but does not exceed 27 pounds per square inch, absolute, at 100° F., flammable liquids must be packed in specification containers as follows:

(1) As prescribed in paragraphs (a) to (11) of this section, except spec. 17E (§ 178.116 of this subchapter). Bung labels required, for metal barrels and drums, as prescribed in paragraph (i) of this section.

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(2) Specification 106A500X, 106A800-XNC, 106A800NCI, 110A500W, (179.300, 179.301 of this subchapter). Tank car tanks.

(3) Specification MC 304, MC 307, MC 330, or MC 331 (§§ 178.340, 178.342, 178.337 of this subchapter). Tank motor vehicles. Necessary interior cleaning of the tanks must be performed between changes in lading. Each safety relief device must have a start-to-discharge pressure of not less than 25 p.s.i.g. Each tank must meet the following requirements as applicable:

(i) Bottom outlets on each specification MC 304 cargo tank must be equipped with valves conforming to the requirements of § 178.342-5(a) of this subchapter; and

(ii) Bottom outlets on each specification MC 330 and MC 331 cargo tank must be equipped with valves conforming to the requirements of § 178.337-11(c) of this subchapter. Safety relief devices on these tanks must be in accordance with specification MC 331 (§ 178.337 of this subchapter) requirements.

(4) Spec. 51 (§ 178.245 of this subchapter). Portable tanks.

(f) *When the vapor pressure exceeds 27 pounds per square inch, absolute, at 100° F.* When the vapor pressure exceeds 27 pounds per square inch, absolute, at 100° F., but does not exceed 40 pounds per square inch (see note 2), absolute, at 100° F., flammable liquids must be packed in specification containers as follows:

(1) Spec. 5, 5A, or 5P (§§ 178.80, 178.81, or 178.92 of this subchapter). Metal barrels or drums, with openings not exceeding 2.3 inches in diameter. Bung labels required as prescribed in paragraph (i) of this section.

(2) Cylinders as prescribed for any compressed gas except acetylene.

(3) Specification 106A500X, 106A800-XNC, 106A800NCI, 110A500W, (179.300, 179.301 of this subchapter). Tank car tanks.

(4) [Reserved]

NOTE 2: When the vapor pressure exceeds 40 pounds per square inch, absolute, at 100° F., these flammable liquids are classed as flammable compressed gases and must be described, packed, and shipped as prescribed for such articles.

(5) Specification MC 304, MC 307, MC 330, or MC 331 (§§ 178.340, 178.342, 178.337). Tank motor vehicles. Bottom outlets on specification MC 304 cargo tanks must be equipped with valves conforming with § 178.342-5(a). Bottom outlets on specifications MC 330 and MC 331 cargo tanks must be equipped with valves conforming with § 178.337-11(c).

(6) Spec. 51 (§ 178.245 of this subchapter). Portable tanks.

(g) [Reserved]

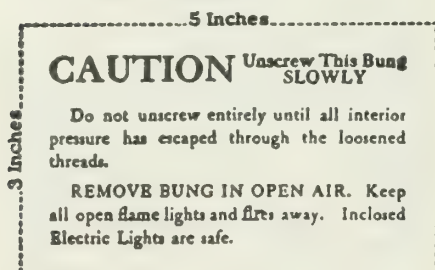
(h) [Reserved]

(i) *Bung label*. A flammable liquid as described in paragraph (e) or (f) of this section, shipped in a metal drum or barrel, in addition to the FLAMMABLE LIQUID label, must be labeled near the bung with a white rectangular label or tag measuring 5 by 3 inches, bearing the wording as displayed below:

BUNG LABEL

(Reduced Size)

(Black printing on white)



(j) *Viscous flammable liquids*. Flammable liquids having a viscosity as determined by one of the methods prescribed in § 173.115(b) must be shipped in specification containers as prescribed in paragraph (k) or (l) of this section.

(k) *Viscous flammable liquids having a vapor pressure which does not exceed 16 pounds per square inch, absolute, at 100° F.* (See paragraphs (c) to (i) of this section for higher pressure liquids) must be prepared for shipment in containers as follows:

(1) As prescribed in paragraphs (a) or (b) of this section, irrespective of flash point.

(2) Spec. 6A, 6B, or 6C (§ 178.97, 178.98, or 178.99 of this subchapter). Metal barrels or drums.

(3) Specification 37A or 37B (§ 178.131, 178.132 of this subchapter). Metal drums (single-trip) not over 5 gallons with welded side seams.

(4) Spec. 42F (§ 178.110 of this subchapter). Aluminum barrels or drums.

(1) *Viscous flammable liquids with flash point above 20° F. to 73° F. and having a vapor pressure which does not exceed 18 pounds per square inch, absolute, at 100° F.* Viscous flammable liquids with flash point above 20° F. to 73° F. and having a vapor pressure which does not exceed 18 pounds per square inch, absolute, at 100° F. must be packaged as follows:

(1) As prescribed in paragraphs (e) to (i) of this section.

(2) Spec. 17E or 17H (§ 178.116 or § 178.118 of this subchapter). Metal drums (single-trip).

(m) *Flammable liquids which are also organic peroxides, oxidizers, corrosive liquids or poison B liquids*. A flammable liquid which is also an organic peroxide, oxidizer, corrosive liquid, or poison B liquid must be packed as follows:

(1) Specification 1A, 1D, or 1EX single-trip (§ 178.1, 178.4, 178.6 of this subchapter). Glass carboys, boxed or in plywood drums, capacity not over 5 gallons for specification 1A.

(2) Spec. 15A, 15B, 15C, 16A, or 19A (§ 178.168, 178.169, 178.170, 178.185, or 178.190 of this subchapter). Wooden boxes with inside containers which must be glass or earthenware, not over 1 gallon each, cushioned with incombustible packing material in sufficient quantity to absorb the contents of the inner container.

(3) Spec. 12B (§ 178.205 of this subchapter). Fiberboard boxes with inside containers which must be glass or earthenware, not over 1 quart each, cushioned with incombustible packing material in sufficient quantity to absorb the contents of the inner container.

(4) Specification 5, 5A, 5B, 5C, 5P, 17C (single-trip), or 17E (single-trip) (§§ 178.80, 178.81, 178.82, 178.83, 178.92, 178.115, 178.116 of this subchapter). Metal barrels or drums. Removable head packagings over 16 gallons capacity are not authorized. Authorized only for materials which will not react dangerously with the drum metal, or be decomposed by contact with it.

(5) Specification 37P (§ 178.133 of this subchapter). Steel drums, not over 15 gallons capacity, with polyethylene liner (non-reusable container). Drums exceeding one gallon capacity must be constructed of at least 24-gauge metal. Au-

thorized only for materials that will not react with polyethylene and result in container failure.

(6) Specification 12B (§ 178.205 of this subchapter). Fiberboard boxes with inside Specification 2E (§ 178.24a of this subchapter) polyethylene bottles not over 1-gallon capacity each. Not more than four 1-gallon polyethylene bottles shall be packed in one outside fiberboard box. Authorized only for material which will not react dangerously with or be decomposed by contact with polyethylene.

(7) Spec. 12B (§ 178.205 of this subchapter). Fiberboard boxes with one inside polyethylene bottle not over 5-gallons capacity, as specified by § 178.205-34 of this subchapter. Authorized only for material which will not react dangerously with or cause decomposition of polyethylene.

(8) Specification 12P (§ 178.211 of this subchapter). Fiberboard boxes with inside specification 2U (§ 178.24 of this subchapter) polyethylene containers not over 5 gallons capacity each. Authorized only for material which will not react dangerously with or cause decomposition of polyethylene.

(9) Cylinders as prescribed for any compressed gas, except acetylene. All cylinder valves must be protected by one of the methods described in § 173.301(g) (1), (2), or (3). See § 173.34 (e) (16).

(10) Specification MC 304: Tank motor vehicle meeting § 178.343-2(c) of this subchapter. If the cargo tank is constructed with bottom outlets, they must meet § 178.342-5(a) of this subchapter. Not authorized for flammable liquids which are also organic peroxides.

(11) Specification MC 307 (§§ 178.340, 178.342 of this subchapter). Tank motor vehicle meeting § 178.343-2(c) of this subchapter. Not authorized for flammable liquids which are also organic peroxides.

(12) Specification MC 310, MC 311, or MC 312 (§§ 178.340, 178.343 of this subchapter). Tank motor vehicles. If the cargo tank is constructed with bottom outlets, they must meet §§ 178.342-5(a) and 178.343-5 of this subchapter. Not authorized for flammable liquids which are also organic peroxides.

(13) [Reserved]

(14) [Reserved]

(15) [Reserved]

(16) Specification 6D or 37M (nonreusable container) (§§ 178.102, 178.134 of this subchapter). Cylindrical steel overpacks with an inside specification 2S or 2SL (§§ 178.35, 178.35a of this subchapter) polyethylene container. Authorized only for materials that will not react with polyethylene and result in container failure.

(17) Specification 6D or 37M (nonreusable container) (§§ 178.102, 178.134 of this subchapter). Cylindrical steel overpacks with an inside specification 2U (§ 178.24 of this subchapter) polyethylene container, not over 5 gallons capacity. Authorized only for materials that will not react with polyethylene and result in container failure.

§ 173.120 Automobiles, motorcycles, tractors, or other self-propelled vehicles.

(a) Automobiles, motorcycles, tractors, or other self-propelled vehicles, equipped with flammable liquid fuel tanks, provided these tanks are securely closed, are not subject to any other requirements for transportation by highway.

(b) Engines or motors (internal combustion). Engines or motors (internal combustion) employing liquid fuel classed as flammable liquid in this chapter, whether shipped separately or as a part of other apparatus, unless specifically exempt in paragraph (a) of this section, must have their fuel tanks completely drained. Fuel may be left in the carburetor, fuel pump, and fuel lines provided the total flammable fuel content does not exceed 16 ounces and provided the lines are tightly closed to prevent leakage of the fuel.

(c) *Truck bodies or trailers on flat cars.* Truck bodies or trailers with automatic heating or refrigerating equipment of the flammable liquid type may be shipped with fuel tanks filled and equipment operating or inoperating, when used for the transportation of other freight and loaded on flat cars as part of a joint rail-highway movement, provided the equipment and fuel supply are of a type approved by the Bureau of Explosives. The heating or refrigerating units are not subject to any other requirements of this subchapter and are considered as carriers' equipment, not as shipments.

§ 173.121 Carbon bisulfide (disulfide).

(a) Carbon bisulfide must be packed in

specification containers as follows:

(1) [Reserved]

(2) Spec. 12A or 12B (§ 178.210 or 178.205 of this subchapter). Fiberboard boxes with inside containers which must be glass or earthenware, not over 1 pint each, or metal cans, not over 1 quart each. Outside containers not to exceed 65 pounds gross weight.

(3) Spec. 15A, 15B, 15C, 16A, or 19A (§ 178.168, 178.169, 178.170, 178.185 or 178.190 of this subchapter). Wooden boxes with inside metal containers, spec. 2A (§ 178.20 of this subchapter); or with inside glass or earthenware containers not over 5 pints capacity each.

(4) Spec. 17E (§ 178.116 of this subchapter). Metal drums (single-trip) not over 5 gallons capacity each, with openings not exceeding 2.3 inches in diameter.

(5) Spec. 5, 5A, or 17C (single-trip) (§ 178.80, 178.81, or 178.115 of this subchapter). Metal barrels or drums not over 55 gallons capacity each, with openings not exceeding 2.3 inches in diameter.

§ 173.122 Acrolein, inhibited.

(a) Acrolein must be inhibited when shipped, and when offered for transportation must be packaged as follows:

(1) Spec. 5, 5A, or 5B (§ 178.80, 178.81, or 178.82 of this subchapter). Metal drums not over 55 gallons capacity each. Spec. 5 or 5B drums must have no opening exceeding 2.3 inches in diameter.

(2) Spec. 15A, 15B, 15C, 16A, or 19A (§ 178.168, 178.169, 178.170, 178.185, or 178.190 of this subchapter). Wooden boxes with inside metal containers, spec. 2A (§ 178.20 of this subchapter), not over 5 gallons capacity each.

(3) [Reserved]

(4) Spec. 17C (§ 178.115 of this subchapter). Metal drums (single-trip) with chime reinforcement for bottom head chime seam and having fixed heads, not over 55 gallons capacity. The openings shall be located in one head and shall not exceed 2.3" in diameter.

(5) Specification 4B240, 4BA240, or 4BW240 (§§ 178.50, 178.51, 178.61 of this subchapter) welded cylinders each having a water capacity not exceeding 500 pounds.

(6) Specification 51 (§ 178.245 of this subchapter) portable tanks each having

a water capacity not exceeding 425 gallons.

(b) Acrolein must be inhibited and when offered for transportation must be packed in specification containers as follows:

(1) Spec. 15A, 15B, 15C, 16A, 19A, or 12B (§ 178.168, § 178.169, § 178.170, § 178.185, § 178.190, or § 178.205 of this subchapter). Wooden or fiberboard boxes having not more than one inside container of glass not exceeding one quart capacity, securely cushioned within a metal container.

§ 173.123 Ethyl chloride.

(a) Ethyl chloride must be packed in specification containers as follows:

(1) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 178.168, 178.169, 178.170, 178.185, or 178.190 of this subchapter). Wooden boxes with glass, earthenware, or metal inside containers not over 1 pound capacity each.

(2) Spec. 12B (§ 178.205 of this subchapter). Fiberboard boxes with glass, earthenware, or metal inside containers not over 1 pound capacity each. Outside containers not to exceed 65 pounds gross weight.

(3) Spec. 5A (§ 178.81 of this subchapter). Metal barrels or drums not over 33 gallons capacity each.

(4) Cylinders as prescribed for any compressed gas, except acetylene.

(5) [Reserved]

(6) Specification MC 330 or MC 331 (§ 178.337). Tank motor vehicles. Tank bottom outlets must be equipped with valves conforming with § 178.334-11(c).

(7) Specification 51 (§ 178.245 of this subchapter) portable tanks.

(b) Outage for all containers must be 7.5 percent or more at 70°F.

§ 173.124 Ethylene oxide.

(a) Ethylene oxide must be packed in specification containers as follows and copper or copper bearing alloys shall not be used in any part of a container, container valve or other container appurtenance if that part is normally in contact with ethylene oxide liquid or vapor.

(1) Spec. 15A, 15B, 15C, or 16A (§§ 178.168, 178.169, 178.170, or 178.185 of this subchapter) wooden boxes and Spec. 12B (§ 178.205 of this subchapter) fiberboard boxes, with metal inside containers not over 12-ounce capacity each. Each inside container must have a minimum bursting strength of 180 psig as prepared

for shipment and be provided with a safety vent having a minimum diameter of 0.1023 inch and closed with fusible metal having a yield temperature of 157 to 170° F. The safety vent opening shall be hot tinned before filling with fusible metal. Filling shall be such that the container will not be liquid full below 185° F. Each inside container must be completely insulated, except for top closure, with two coats of heat-retardant paint, of type approved by the Bureau of Explosives, applied over suitable primer and finished with suitable waterproof paint; or with other equally efficient insulation approved by the Bureau of Explosives. Not more than 12 inside containers may be packed in one outside container.

(2) Cylinders as prescribed for any compressed gas, except acetylene, not exceeding 30 gallons nominal water capacity, which meet the following requirements. All cylinders must be seamless or steel welded. Cylinders must be equipped with safety devices of the fusible plug type with threaded straight bore orifice, with yield temperature of 157° to 170° F. having a minimum vent area of 0.0055 square inch per pound of water capacity of the container for containers not over 1-gallon capacity and 0.0012 square inch per pound of water capacity of the container for all containers over 1-gallon capacity. Each cylinder must be tested for leakage at a pressure of at least 15 p.s.i. gauge with an inert gas before each refilling. Filling must be such that the container will not be liquid full at 185° F. Pressurizing valves must be provided for all containers over 1-gallon capacity. Eductor tubes must be provided for all containers over 5-gallon capacity. Cylinders having a water capacity in excess of 1 gallon must be insulated with at least three coats of heat-retardant paint, of a type approved by the Bureau of Explosives, applied over suitable primer and finished with suitable waterproof paint; or with other equally efficient insulation approved by the Bureau of Explosives.

(3) In addition to specification packagings prescribed in this section, ethylene oxide may be shipped when packed in strong noncombustible outside packagings, with inside containers which must be securely sealed glass ampules or vials, contents not over 100 grams each, or inside aluminum cartridges, contents not over 135 grams each, cushioned in

vermiculite or equally efficient noncombustible cushioning material. Not more than 100 grams of ethylene oxide shall be packed in any outside packaging except a maximum of 12 aluminum cartridges may be packed in a DOT Specification 12B (§ 178.205 of this subchapter) fiberboard box having top and bottom pads and an inside perimeter liner. A maximum of 10 such boxes may be overpacked in a master carton under the provisions of § 173.25(a).

(4) Spec. 5P. Lagged steel drums not over 61 gallons capacity each. Drums must be equipped with safety devices of the fusible plug type with threaded straight bore orifice, with yield temperature of 157 to 170° F. having a minimum vent area of 0.0055 square inch per pound of water capacity of the container for containers not over 1 gallon capacity and 0.0012 square inch per pound of water capacity of the container for all containers over one gallon capacity. Each drum must be tested for leakage at a pressure of at least 15 p. s. i. gauge with an inert gas before each refilling; top head of each drum must be plainly marked with paint "Keep This End Up." Filling shall be such that the container will not be liquid full below 185° F. and the maximum filling for 61 gallon drums must not exceed 55 gallons of ethylene oxide at 60° F.

(5) [Reserved]

(6) Specification 51 (§ 178.245 of this subchapter) portable tank. Each tank, loaded or empty, must be padded with dry nitrogen or other suitable dry inert gas in sufficient quantity to render the vapor phase in the tank nonflammable at a temperature up to 105° F. Consideration must be given to the lading temperature and the solubility of the gas in ethylene oxide as well as the partial pressure required of the padding gas used to provide this protection. The gas must be free of impurities which may cause the ethylene oxide to rearrange chemically or to polymerize, decompose, or undergo other violent chemical reaction. Each tank must be constructed to be in compliance with the following requirements:

(1) The tank must be insulated with mineral wool or glass fiber of sufficient

thickness so that the thermal conductance at 60°F. is not more than 0.075 B.t.u. per hour, per square foot, per degree Fahrenheit temperature differential. When a tank is equipped with fusible plugs instead of a safety relief valve or frangible disc, insulation must meet the requirements of paragraph (a) (6) (iii) of this section.

(ii) The insulating material of the tank must be protected by a steel jacket having a minimum thickness of 12 gauge. This jacket must be applied to prevent moisture from coming in contact with the insulation.

(iii) Each tank must be equipped with a safety relief valve or frangible disc, meeting the requirements of § 173.315, set to relieve at 75 p.s.i.g. Instead of a safety relief valve or frangible disc, a tank may be equipped with safety devices of the fusible plug type with threaded straight base orifice, with yield temperature of 157° to 170°F., having a minimum vent area of 0.0012 square inch per pound of water capacity of the container. When a fusible plug is used instead of a safety relief valve or frangible disc, the tank must be insulated with mineral wool or glass fiber of such insulating properties and required additional thickness that the tank filled as for shipment will not rupture in a fire.

(iv) Filling must be such that the tank will not be liquid full below 185°F.

(v) Copper, silver, mercury, magnesium, or their alloys may not be used in any part of the tank or appurtenances if that part or appurtenance is normally in contact with ethylene oxide liquid or vapor.

(vi) Neoprene, natural rubber, and asbestos gaskets are prohibited. All packings and gaskets must be constructed of materials which do not react spontaneously with or lower the autoignition temperature of ethylene oxide.

(vii) The capacity of the tank may not exceed 300 gallons.

§ 173.125 Alcohol, n.o.s. (flammable liquid).

(a) Except as otherwise provided in this Part, alcohol, n.o.s., which is classed as a flammable liquid must be packaged as follows:

(1) In containers as prescribed in § 173.119 (a) and (b).

(2) Securely closed metal tanks of not exceeding 18 gallons capacity, made of metal not lighter than 20 gauge, United States standard, packed in strong outside wooden boxes, may be used for the transportation of natural history or laboratory specimens preserved in alcohol, when shipped by or for the United States Government.

(3) [Reserved]

(4) [Reserved]

(5) Spec. 6D (§ 178.102 of this subchapter). Cylindrical steel overpack with inside spec. 2S (§ 178.35 of this subchapter) polyethylene container.

(6) Spec. 12B (§ 178.205 of this subchapter). Fiberboard boxes with inside polyethylene bottles, not over 1-gallon capacity each, suitably cushioned to prevent movement within the box.

(7) Specification 12P (§ 178.211 of this subchapter). Fiberboard box with inside Specification 2U (§ 178.24 of this subchapter) polyethylene container not over 5 gallons capacity each. Wire staples are not authorized for assembly or closure of boxes, except when polyethylene container is completely enclosed in inside boxes free of wire staples or other projections that could cause failures.

§ 173.126 Nickel carbonyl.

Nickel carbonyl must be packed in specification cylinders as prescribed for any compressed gas, except acetylene. Cylinders used exclusively for nickel carbonyl may be given a complete external visual inspection at the time periodic retest becomes due in lieu of the interior hydrostatic pressure test required by § 173.34(e). Visual inspection must be in accordance with CGA Pamphlet C-6.

§ 173.127 Nitrocellulose or collodion cotton, fibrous or nitrostarch, wet; nitrocellulose flakes; colloided nitrocellulose, granular, flake, or block, and lacquer base or lacquer chips, wet.

(a) Nitrocellulose, fibrous, wet with alcohol or solvent, must contain at least 25 percent by weight of alcohol or a solvent with flash point not lower than 30° F.; collodion cotton, fibrous and nitrostarch, wet with alcohol or a solvent, must contain at least 30 percent by weight of alcohol or a solvent with flash point not lower than 30° F.; nitrocellulose flakes; colloided nitrocellulose, granular or flake; lacquer base or lacquer chips, wet with alcohol or a solvent, must contain at least 20 percent by weight of alcohol or a solvent with flash point not lower than 30° F., and nitrocellulose blocks wet with alcohol must contain at least 25 percent by weight of alcohol and must be packed in specification containers as follows:

(1) Containers, except cargo tanks, as prescribed in § 173.119.

(2) Spec. 6A, 6B, 6C, or 6J (§ 178.97, § 178.98, § 178.99, or § 178.100 of this subchapter). Metal barrels or drums not over 55 gallons capacity. Spec. 6J (§ 178.100 of this subchapter) drums must have removable heads of 14 gauge metal or 16 gauge metal with one or more corrugations near the periphery and heads must have a minimum convexity of $\frac{3}{8}$ inch; each drum must have three rolled or swedged-in hoops, one of which shall be in the body near the curl.

(3) Spec. 42F (§ 178.110 of this subchapter). Aluminum barrels or drums. Authorized only for nitrocellulose or collodion cotton, fibrous, wet, or colloided nitrocellulose, granular or flake, wet.

(4) Spec. 37A or 37B (§ 178.131 or § 178.132 of this subchapter). Metal barrels or drums.

(5) Spec. 6J (§ 178.100 of this subchapter). Metal drums. Authorized only for nitrocellulose in solid block forms and wet with alcohol to not less than 25 percent by weight. Authorized only for truckload shipments.

(b) Except for spec. 37A which is limited to 480 pounds, gross weight of any container must not exceed 490 pounds.

§ 173.128 Paints and related materials (flammable liquids).

(a) Except as otherwise provided in this Part, a flammable liquid which is a paint, enamel, lacquer, stain, shellac, varnish, liquid aluminum, liquid bronze, liquid gold, liquid wood filler, liquid lacquer base or a thinning, reducing, or removing compound therefor, or a liquid drier therefor, must be packaged as follows:

(1) As prescribed in § 173.119, according to flash point, pressure, or viscosity.

(2) Specification 37A or 37B (§ 178.131, § 178.132 of this subchapter). Metal drums (single-trip) not over 5 gallons capacity, with welded side seams for drums over 2 gallons capacity, irrespective of flash point or viscosity. Specification 37A metal drums constructed with 26-gauge body sheets, 24-gauge removable heads, and 26-gauge bottom heads are authorized for not over 80 pounds gross weight.

(3) Specifications 52,¹ or 57 (§§ 178.251, 178.253 of this subchapter). Metal portable tank.

(4) Specification 37C (§ 178.135 of this subchapter). Metal drums (non-reusable containers) not over 5 gallons capacity each. Authorized only for materials having flash point above 20° F.

(b) [Reserved]

(c) The flammable liquids identified in paragraph (a) of this section, in glass packagings of not over 1 quart capacity each, or in metal packagings of not over 5 gallons capacity each, further overpacked in a strong outside packaging are excepted from the specification packaging requirements of this Part.

§ 173.129 Polishes (flammable liquids).

(a) Except as otherwise provided in this Part, a flammable liquid which is a metal, stove, furniture, or wood polish must be packaged as follows:

(1) As prescribed in § 173.119, according to flash point, pressure, or viscosity.

¹ Use of existing tanks authorized. Construction not authorized after May 31, 1972.

(2) Specification 37A or 37B (§§ 178.131, 178.132 of this subchapter). Metal (single-trip) not over 5 gallons capacity with welded side seams, irrespective of flash point or viscosity.

(b) Liquid metal, stove, furniture, and wood polish, in glass packagings not over 1 quart capacity each, or metal packagings not over 5 gallons each, further overpacked in a strong outside packaging is excepted from the specification packaging requirements of this part.

§ 173.130 Refrigerating machines.

Refrigerating machines assembled for shipment and containing limited quantities of 15 pounds or less of a flammable liquid for their operation are excepted from labeling and the specification packaging requirements of this subchapter. In addition, shipments are not subject to Part 172 or Part 177 of this subchapter.

§ 173.131 Road asphalt, or tar, liquid.

(a) Road asphalt, or tar, liquid, must be packed in specification containers as follows:

(1) As prescribed in § 173.119, according to flash point, pressure, or viscosity.

(2) If the material has a flash point of 73° F. or higher, it may be transported in a nonspecification cargo tank that is at least equivalent in design and construction to specification MC 306 (§§ 178.340, 178.341 of this subchapter) except for the requirements of §§ 178.340-10, 178.341-3, 178.341-4, and 178.341-5.

§ 173.132 Cement liquid, n.o.s.; container cement; linoleum cement; pyroxylin cement; rubber cement; tile cement; wallboard cement; coating solution (flammable liquids).

(a) Except as otherwise provided in this part, a flammable liquid which is a liquid cement, n.o.s. container cement, linoleum cement, pyroxylin cement, rubber cement, tile cement, wallboard

cement, or coating solution must be packaged as follows:

(1) As prescribed in § 173.119, irrespective of flash point or viscosity.

(2) Specification 52,* or 57 (§§ 178.251, 178.253 of this subchapter). Metal portable tank. Authorized for materials irrespective of flash point but only those defined as viscous liquids.

(3) Specification 37C (§ 178.135 of this subchapter). Metal drums (non-reusable container) not over 5 gallons capacity each. Authorized only for materials having flash point above 20° F.

(b) The cements identified in paragraph (a) of this section, except any cement containing carbon bisulfide, in glass or leakproof packagings consisting of a fiberboard body and metal tops and bottoms of not over 1 quart capacity each, or metal packagings of not over 5 gallons capacity each, further overpacked in a strong outside packaging are excepted from the specification packaging requirements of this Part.

§ 173.133 Spirits of nitroglycerin.

(a) Spirits of nitroglycerin must consist of not over 10 percent by weight of nitroglycerin in ethyl alcohol. Solutions of nitroglycerin must consist of not over 10 percent by weight of nitroglycerin in acetone. They must be packed in specification containers as follows:

(1) Spec. 15A, 15B, 15C, 16A, or 19A (§ 178.168, 178.169, 178.170, 178.185, or 178.190 of this subchapter). Wooden boxes lined with paraffined paper, spec. 2L (§ 178.30 of this subchapter), and with metal inside containers, securely closed with rubber stoppers tied in place. The inside containers must be entirely surrounded by at least 2 inches of dry, fine sawdust or kieselguhr. There must be not over 6 quarts of the mixture in each outside container.

(b) Spirits of nitroglycerin consisting of not over 1 percent by weight of nitroglycerin in ethyl alcohol, in addition to containers specified in paragraph (a)

*Use of existing tanks authorized Construction not authorized after May 31, 1972.

(1) of this section, may be packed in specification containers as follows:

(1) Spec. 15A, 15B, 15C, 16A, or 19A (§ 178.168, 178.169, 178.170, 178.185, or 178.190 of this subchapter). Wooden boxes, with glass inside containers not over 1 quart capacity each, cushioned by at least 2 inches of dry, fine sawdust or kieselguhr.

§ 173.134 Pyroforic liquids, n.o.s.

(a) Pyroforic liquids, n.o.s., must be packed in specification containers, or in devices or apparatus approved by the Bureau of Explosives, as follows:

(1) Cylinders as prescribed for any compressed gas except acetylene and having a minimum design pressure of 175 pounds per square inch. Cylinders must be equipped with steel valve protection caps or collars, or must be packed in strong wooden boxes and secured therein to protect valves. Safety relief devices, if used, must be in the vapor space of loaded cylinders. (See also 177.837(d) of this subchapter.)

(2) Spec. 15A, 15B, or 15C (§ 178.168, 178.169, or 178.170 of this subchapter) wooden boxes or spec. 12B (§ 178.205 of this subchapter) fiberboard boxes enclosing not more than four spec. 2A (§ 178.20 of this subchapter) metal cans with inside containers of glass or metal, not over one quart capacity each, having positive screw-cap closures adequately gasketed ahead of the threads. Inside containers must be cushioned on all sides with dry, absorbent, incombustible material in a quantity sufficient to absorb entire contents. Spec. 2A cans must be closed by positive means, not friction.

(3) Spec. 17C or 37A (§ 178.115 or 178.131 of this subchapter). Metal drums (single-trip) with inside metal cans not over 1 gallon capacity each, constructed of not less than 28 gauge electro-coated tin plate closed by positive means, not friction. Inside containers shall have no opening exceeding 1 inch diameter and must be surrounded on all sides with incombustible cushioning material. Spec. 17C, 30-gallon capacity drums, shall contain not more than 20 gallons of pyroforic liquids, n.o.s. per drum and 55-gallon capacity drums shall contain not more than 35 gallons of pyroforic liquids, n.o.s. per drum; each layer of inside containers must be separated by a

tin plate separator in addition to cushioning material. Spec. 37A drums shall not exceed 5 gallons capacity each.

(4) [Reserved]

(5) Spec. 51 (§ 178.245 of this subchapter). Portable tanks having a minimum design pressure of 175 pounds per square inch. Safety relief devices must communicate with the vapor space when tanks are fully loaded.

(6) Specification MC 330 or MC 331 (§ 178.337). Tank motor vehicles having a minimum design pressure of 175 p.s.i. Safety relief devices must communicate with the vapor space when tanks are fully loaded. Tank bottom outlets must be equipped with valves conforming with § 178.337-11(c).

§ 173.135 Diethyl dichlorosilane, dimethyl dichlorosilane, ethyl dichlorosilane, ethyl trichlorosilane, methyl trichlorosilane, trimethyl chlorosilane, and vinyl trichlorosilane

(a) Diethyl dichlorosilane, dimethyl dichlorosilane, ethyl dichlorosilane, ethyl trichlorosilane, methyl trichlorosilane, trimethyl chlorosilane, and vinyl trichlorosilane must be packaged as follows:

(1) Spec. 15A or 16B (§§ 178.168 or 178.186 of this subchapter). Wooden boxes with glass inside containers not over 1 gallon capacity each securely closed and cushioned with incombustible absorbent material.

(2) Spec. 17H or 37A (§ 178.118 or § 178.131 of this subchapter). Metal drums (single-trip) with glass inside containers not over 1 gallon capacity each securely closed and cushioned with incombustible absorbent material.

(3) Spec. 5A (§ 178.81 of this subchapter). Metal drums not over 55 gallons capacity.

(4) Spec. 5F (§ 178.85 of this subchapter). Metal drums not over 11 gallons capacity.

(5) Specifications 5, 5B, 5C, and 17E (single-trip) (§§ 178.80, 178.82, 178.83, 178.116 of this subchapter). Metal drums.

(6) Specification cylinders as prescribed for any compressed gas, except acetylene.

(7) [Reserved]

(8) [Reserved]

(9) Specification MC 300, MC 303, MC 304, MC 306, or MC 307 (§§ 178.340, 178.341, 178.342). Tank motor vehicles having cargo tanks of steel or stainless steel construction. Tank bottom outlets must be equipped with valves conforming with § 178.342-5(a).

§ 173.136 Methyl dichlorosilane and trichlorosilane.

(a) Methyl dichlorosilane and trichlorosilane must be packed in specification containers as follows:

(1) Spec. 15A or 16B (§§ 178.168 or 178.186 of this subchapter). Wooden boxes with glass inside containers not over 1 quart capacity each securely closed and cushioned with incombustible absorbent material.

(2) Spec. 17H or 37A (§ 178.118 or § 178.131 of this subchapter). Metal drums (single-trip) with glass inside containers not over 1 quart capacity each securely closed and cushioned with incombustible absorbent material.

(3) Specification 5A, 5B, or 5C (§§ 178.81, 178.82, 178.83 of this subchapter). Metal drums not over 55 gallons capacity each. Specification 5B drums must have no opening exceeding 2.3 inches in diameter.

(4) Specification 5F (§ 178.85 of this subchapter). Metal drums not over 11 gallons capacity.

(5) Specification cylinders as prescribed for any compressed gas, except acetylene.

(6) [Reserved]

(7) [Reserved]

(8) Specification MC 330 or MC 331 (§ 178.337). Tank motor vehicles. Tank bottom outlets must be equipped with valves conforming with § 178.337-11(c).

(9) Spec. 51 (§ 178.245 of this subchapter). Portable tanks.

§ 173.137 Lithium aluminum hydride, ethereal.

(a) Lithium aluminum hydride, ethereal, must be packed in specification containers as follows:

(1) Spec. 15A (§ 178.168 of this sub-

chapter). Wooden boxes with inside glass or earthenware containers not over 1 quart each enclosed in air-tight metal cans and cushioned with sufficient incombustible cushioning material to completely absorb contents in event of breakage.

(2) Spec. 6A, 6B, 6C, or 17H (single-trip) (§§ 178.97, 178.98, 178.99, or 178.118 of this subchapter). Metal barrels or drums with not more than one inside glass container not exceeding 2 gallons capacity. The inside container must be completely cushioned in sufficient incombustible cushioning material to completely absorb the contents in event of breakage.

(3) Specification cylinders as prescribed for any compressed gas, except acetylene. Valves or fittings must be protected from injury by a cap or equally efficient device.

§ 173.138 Pentaborane.

Pentaborane must be packed in specification cylinders as prescribed for any compressed gas, except acetylene. Cylinders must be protected with valve protection cap or must be packed in strong wooden boxes and blocked therein so as to protect the valves from injury under conditions normally incident to transportation. Cylinders not exceeding 2 inches in diameter nor 6 inches in length, excluding the length of the valve, may also be packed in strong solid fiberboard boxes, having no outside dimension less than 4 inches, completely filled with layers of strong corrugated fiberboard, the center of which shall be cut out to fit the cylinder valve, and otherwise so designed that neither the cylinder nor the valve will be in contact with any wall of the box under conditions normally incident to transportation.

§ 173.139 Ethylene imine, inhibited, and propylene imine, inhibited.

(a) Ethylene imine and propylene imine must be inhibited and must be packed in specification containers as follows:

(1) Spec. 15A or 15B (§ 178.168 or § 178.169 of this subchapter). Wooden boxes, with inside containers which must be securely sealed glass ampules or glass bottles, contents not over 16 fluid ounces or 1 pound each, in tightly closed metal cans. If more than one ampule or bottle is packed in a metal can, ampules or

bottles must be separated by fiberboard partitions. Ampules or bottles must be cushioned in vermiculite or equally efficient incombustible cushioning material in quantity sufficient to completely absorb contents in event of breakage. Not more than 5 pints of liquid may be packed in any outside wooden box.

(2) Spec. 15A, 15B, or 15C (§§ 178.168, 178.169, or 178.170 of this subchapter). Wooden boxes with not more than four inside metal drums, spec. 37B (§ 178.132 of this subchapter), not over 1-gallon capacity each, or not more than one spec. 37B metal drum of 5-gallons capacity, in one outside box. Inside drums must be surrounded on all sides with incombustible absorbent cushioning material.

(3) Spec. 6A, 6B, 6C, or 6J (§§ 178.97, 178.98, 178.99, or 178.100 of this subchapter). Metal barrels or drums, with one inside spec. 17E (§ 178.116 of this subchapter) metal drum not over 30-gallons capacity. Inside drum must be completely surrounded with incombustible cushioning material.

(4) [Reserved]

(5) Spec. 5A (§ 178.81 of this subchapter). Metal barrels or drums not over 55-gallon capacity. Authorized for propylene imine, inhibited only.

(6) Specification 4BA240 or 4BW240 (§§ 178.51, 178.61 of this subchapter). Cylinders of all welded construction. Authorized only for propylene imine, inhibited.

§ 173.140 Zirconium, metallic, solutions, or mixtures thereof, liquid.

(a) Zirconium, metallic, solutions, or mixtures thereof, liquid, must be packed in specification containers as follows:

(1) Spec. 15A, 15B, or 15C (§§ 178.168, 178.169, or 178.170 of this subchapter). Wooden boxes with inside metal containers. Each inside container shall not contain more than 20 individual glass or porcelain jars, not exceeding 2-ounce capacity each, securely closed and completely cushioned in incombustible cushioning material in sufficient quantity to completely absorb the contents.

§ 173.141 Amyl mercaptan, butyl mercaptan, ethyl mercaptan, isopropyl mercaptan, propyl mercaptan, and aliphatic mercaptan mixtures.

(a) Amyl mercaptan, butyl mercaptan, ethyl mercaptan, isopropyl mercaptan, propyl mercaptan, and aliphatic mercaptan mixtures must be packed in

specification containers as follows:

(1) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 178.168, 178.169, 178.170, 178.185, or 178.190 of this subchapter). Wooden boxes with securely closed inside metal containers not over 5 gallons capacity each, or in tightly closed glass bottles not exceeding 1 quart capacity each, securely cushioned in sufficient quantity of absorbent material to completely absorb the contents in event of leakage.

(2) Spec. 12B (§ 178.205 of this subchapter). Fiberboard boxes with securely closed inside metal containers not over 1 gallon capacity each; or in tightly closed glass bottles not exceeding 1 quart capacity each, securely cushioned in sufficient quantity of absorbent material to completely absorb the contents in event of leakage.

(3) Spec. 5, 5A, 5B, or 5C (§§ 178.80, 178.81, 178.82 or 178.83 of this subchapter). Metal barrels or drums, with not more than one opening not exceeding 2.3 inches in diameter and not more than one vent opening not exceeding 1 inch in diameter. Gaskets are required and must be not less than $\frac{3}{32}$ -inch thick and of resilient material such as polyethylene, neoprene, or equally efficient material.

(4) Spec. 17C (§ 178.115 of this subchapter). Metal drums (single-trip), with not more than one opening not exceeding 2.3 inches in diameter and not more than one vent opening not exceeding 1 inch in diameter. Gaskets are required and must be not less than $\frac{3}{32}$ -inch thick and of resilient material such as polyethylene, neoprene, or equally efficient material.

(5) Spec. 17E (§ 178.116 of this subchapter). Metal drums (single-trip), not over 5 gallons capacity, without opening except bung hole not exceeding 2.3 inches in diameter. Gaskets are required and must be not less than $\frac{3}{32}$ -inch thick and of resilient material such as polyethylene, neoprene, or equally efficient material. (See also paragraph (a) (6) of this section.)

(6) Spec. 17E (§ 178.116 of this subchapter). Metal drums (single-trip), not over 55 gallons capacity, with not more than one opening not exceeding 2.3 inches in diameter and not more than one vent opening not exceeding 1 inch in diameter. Gaskets are required and must be not less than $\frac{3}{32}$ -inch thick and of resilient material such as polyethyl-

ene, neoprene, or equally efficient material. Authorized only for mercaptans having flash point above 20° F.

(7) Specification 106A500X or 110A500W (§§ 179.300, 179.301 of this subchapter). Tank car tanks.

(8) Specification MC 330 or MC 331 (§ 178.337). Tank motor vehicles. Tank bottom outlets must be equipped with valves conforming with § 178.337-11(c).

(9) Specification cylinders as prescribed for any compressed gas, except acetylene.

(10) Specification 51 (§ 178.245 of this subchapter). Portable tank. Each tank must be equipped with safety relief valves which must be in compliance with all requirements of § 173.315(i). A tank must not be liquid full at 130°F.

(b) Warning or odorizing devices containing not more than one ounce of a mercaptan or an aliphatic mercaptan mixture in a hermetically sealed container or in a hermetically sealed portion of the device are not subject to the regulations in this chapter.

§ 173.142 [Reserved]

§ 173.143 Methylchloromethyl ether, anhydrous.

(a) Methylchloromethyl ether, anhydrous, must be packed in specification containers as follows:

(1) Spec. 5K (§ 178.88 of this subchapter). Nickel barrels or drums.

(2) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 178.168, 178.169, 178.170, 178.185 or 178.190 of this subchapter). Wooden boxes with inside containers which must be glass or earthenware, not over 1 gallon capacity each, except that inside containers up to 3 gallons each are authorized when only one inside container is packed in each outside container.

§ 173.144 Ink (flammable liquid).

(a) Except as otherwise provided in this part, ink which is classed as a flammable liquid in this subchapter must be packaged as follows:

(1) In containers as prescribed in § 173.119, according to flash point, pressure, or viscosity.

(2) Spec. 17C (§§ 178.115 of this subchapter). Full removable head metal drums (single-trip).

(3) Specification 37C (§ 178.135 of this subchapter). Metal drums (non-reusable

container) not over 5 gallons capacity each. Authorized only for material having flash point over 20° F.

(b) Ink in glass packagings not over 1 quart capacity each, or in metal packagings not over 5 gallons capacity each, further overpacked in a strong outside packaging is excepted from the specification packaging requirements of this Part.

§ 173.145 Dimethylhydrazine, unsymmetrical, and methylhydrazine.

(a) Dimethylhydrazine, unsymmetrical, and methylhydrazine must be packed in specification containers as follows:

(1) Specification 1D (§ 178.4 of this subchapter). Boxed glass carboys.

(2) Spec. 15A, 15B, or 15C (§ 178.168, § 178.169, or § 178.170 of this subchapter). Wooden boxes with inside containers which must consist of glass bottles not exceeding 1-gallon capacity each, cushioned by means of vermiculite within tin cans which shall be tightly closed, or containers not over 2 quarts capacity each made of aluminum not less than 0.04 inch thick. Closures and gaskets must be of material which will not react dangerously with or be decomposed by contact with the contents.

(3) Spec. 5, 5A, or 5C (§ 178.80, § 178.81, or § 178.83 of this subchapter); or 17E (§ 178.116 of this subchapter) (single-trip). Metal barrels or drums which shall be of type 304 or 347 stainless steel, with openings not exceeding 2.3 inches in diameter.

(4) Spec. 17C (§ 178.115 of this subchapter). Metal barrels or drums (single-trip) with openings not exceeding 2.3 inches in diameter. Authorized only for dimethylhydrazine, unsymmetrical.

(5) Spec. 42B (§ 178.107 of this subchapter). Aluminum drums. Authorized only for dimethylhydrazine, unsymmetrical.

(6) [Reserved]

(7) Specification MC 300, MC 301, MC 302, MC 303, MC 304, MC 305, MC 306, MC 307, MC 310, MC 311, or MC 312 (§§ 178.341, 178.342, 178.343 of this subchapter). Tank motor vehicle without bottom discharge outlets and equipped with steel safety valves of approved design.

§ 173.146 Heaters for refrigerator cars, flammable liquid fuel type.

(a) Heaters of the liquid fuel type for refrigerator cars, containing flammable liquid fuel, may be shipped in truckload lots provided each heater shall have been inspected to see that flame has been extinguished, that there is no leakage of fuel, and that controls are in the "off" position. Heaters shall be loaded and braced so as to prevent falling, tipping, or mechanical damage under normal conditions incident to transportation.

(b) Heaters of the liquid fuel type for refrigerator cars must have their flammable liquid fuel tanks completely drained if offered for transportation or transported in less-than-truckload lots.

§ 173.147 Methyl vinyl ketone, inhibited.

(a) Methyl vinyl ketone must be inhibited and must be packed in specification containers as follows:

(1) As prescribed in § 173.119(a) or (b).

(b) Limited quantities of inhibited methyl vinyl ketone, in a glass or metal inside container having a capacity of no more than 4 fluid ounces with no more than one such container securely closed and efficiently cushioned in a strong outside packaging, is excepted from labeling and the specification packaging requirements of this subpart. In addition, shipments are not subject to Part 172 or Part 177 of this subchapter.

§ 173.148 Monoethylamine.

(a) Monoethylamine must be packed in specification containers as follows:

(1) Specification 5, 5A, or 5P (§§ 178.80, 178.81, 178.92 of this subchapter). Metal barrel or drum equipped with openings not exceeding 2.3 inches in diameter. Bung labels must be applied and must meet the requirements prescribed in § 173.119(i).

(2) Cylinders as prescribed for any compressed gas except acetylene.

(3) [Reserved]

(4) Specification 106A500X or 110A500W (§§ 179.300, 179.301) tanks. Authorized for transportation by highway. (See § 177.834-(m) of this subchapter for special requirements).

(5) Specification MC 304 or MC 307 (§§ 178.340, 178.342). Tank motor vehicles. Tank bottom outlets must be equipped with valves conforming with § 178.342-5(a).

§ 173.149 Methyl magnesium bromide in ethyl ether in concentrations not over 40 percent.

(a) Methyl magnesium bromide in ethyl ether in concentrations not over 40 percent must be packed in specification containers as follows:

(1) As prescribed in § 173.134 paragraphs (a) and (b).

(2) Spec. 12B (§ 178.205 of this subchapter). Fiberboard boxes with inside glass bottles not over 1 quart capacity each. Inside containers must be surrounded on all sides with dry absorbent noncombustible material in quantity sufficient to absorb entire contents. Authorized gross weight not over 65 pounds.

(3) Spec. 17C (§ 178.115 of this subchapter). Metal drums (single-trip) with openings not exceeding 2.3 inches in diameter.

§ 173.149a Nitromethane.

Nitromethane must be packaged as specified in § 173.119(b) except that shipments in cargo tanks, portable tanks, and any container having a capacity greater than 110 gallons is forbidden.

Subpart E—Flammable Solids, Oxidizers, and Organic Peroxides; Definitions and Preparation

§ 173.150 Flammable solid; definition.

For the purpose of this subchapter, "Flammable solid" is any solid material, other than one classed as an explosive, which, under conditions normally incident to transportation is liable to cause fires through friction, retained heat from manufacturing or processing, or which can be ignited readily and when ignited burns so vigorously and persistently as to create a serious transportation hazard. Included in this class are spontaneously combustible and water-reactive materials.

§ 173.151 Oxidizer; definition.

An oxidizer for the purpose of this subchapter is a substance such as a chlorate, permanganate, inorganic peroxide, nitro carbo nitrate, or a nitrate, that yields oxygen readily to stimulate the combustion of organic matter.

§ 173.151a Organic peroxide; definition.

(a) An organic compound containing

the bivalent —O—O— structure and which may be considered a derivative of hydrogen peroxide where one or more of the hydrogen atoms have been replaced by organic radicals must be classed as an organic peroxide unless:

(1) The material meets the definition of an explosive A or explosive B, as prescribed in Subpart C of this part, in which case it must be classed as an explosive.

(2) The material is forbidden to be offered for transportation according to § 172.101 or § 173.21 of this subchapter.

(3) The material is not specifically identified as an organic peroxide in § 172.101 and meets the definition of a flammable liquid, or

(4) According to data on file with the Materials Transportation Bureau, it has been determined that the material does not present a hazard in transportation.

§ 173.152 Packing.

(a) Flammable solids or oxidizing materials must not be packed in the same outside container with corrosive liquids unless the corrosive liquids are in bottles, cushioned by incombustible absorbent material, in tightly closed metal containers.

NOTE 1: Oxidizing or other materials in quantity not exceeding 4 ounces, in securely closed metal cans, packed in the same compartment with other securely packed materials necessary for a complete fumigant, are acceptable for transportation.

(b) Closing and cushioning. All containers must be tightly and securely closed. Inside containers must be cushioned as prescribed or in any case when necessary to prevent breakage or leakage.

§ 173.153 Limited quantities of flammable solids, oxidizers and organic peroxides.

(a) Limited quantities of flammable solids for which exceptions are permitted as noted by reference to this section in § 172.101 of this subchapter, are excepted from labeling and specification packaging requirements when packed according to the following paragraph. In addition, shipments are not subject to Part 172 or Part 177 of this subchapter.

(1) In inside containers not over 1 pound net weight each, in outside containers not exceeding 25 pounds net weight each.

(b) Limited quantities of oxidizers and organic peroxides for which exceptions are

permitted as noted by reference to this section in § 172.101 of this subchapter are excepted from labeling and specification packaging requirements when packed according to the following paragraphs. In addition, shipments are not subject to Part 172 or Part 177 of this subchapter.

(1) Oxidizers in inside containers not over 1 pound net weight each, in outside containers not exceeding 25 pounds net weight each.

(2) Organic peroxides, except acetyl benzoyl peroxide and benzoyl peroxide, as follows:

(i) In inside containers which must be securely packed and cushioned with non-combustible cushioning material (except that cushioning material is not required when the liquid is contained in strong, securely closed plastic packagings of not over 1 ounce by volume capacity each), further overpacked in strong outside packagings containing not over 1 pint or 1 pound net weight of the material.

(ii) In not more than 24 inside fiber-board containers each having not more than 70 securely closed tubes having a maximum fluid capacity each of 1½-ounce and securely packed in non-combustible cushioning material.

(c) Special exceptions for shipment of certain flammable solids, oxidizers and organic peroxides in the ORM-D Class are provided in Subpart N of this part.

§ 173.154 Flammable solids, organic peroxide solids and oxidizers not specifically provided for.

(a) Flammable solids, organic peroxide solids and oxidizers as defined in §§ 173.150 and 173.151, other than those for which special packing requirements are prescribed, must be packed in specification containers of a design and constructed of materials that will not react dangerously with or be decomposed by the chemical packed therein. Specific packaging requirements are as follows:

(1) Spec. 6A, 6B, or 6C (§§ 178.97, 178.98, or 178.99 of this chapter). Metal barrels or drums.

(2) Spec. 17C, 17E, 17H, 37A or 37B (§§ 178.115, 178.116, 178.118, 178.131, or 178.132 of this chapter), metal drums (single-trip).

(3)-(5) [Reserved]

ILLINOIS HAZARDOUS MATERIALS TRANSPORTATION REGULATIONS

§ 173.151a ORGANIC PEROXIDE; DEFINITION.

(a) An organic compound containing the bivalent -O-O- structure and which may be considered a derivative of hydrogen peroxide where one or more of the hydrogen atoms have been replaced by organic radicals must be classed as an organic peroxide unless:

(1) The material meets the definition of an explosive A or explosive B, as prescribed in Subpart C of this part, in which case it must be classed as an explosive,

(2) The material is forbidden to be offered for transportation according to § 172.101 or § 173.21 of this subchapter,

(3) It is determined that the predominant hazard of the material containing an organic peroxide is other than that of an organic peroxide, or

(4) According to data on file with the Materials Transportation Bureau, it has been determined that the material does not present a hazard in transportation.

(Source: 7 Ill. Reg 3486, effective April 2, 1983)

§ 173.152 PACKING.

(a) Flammable solids or oxidizing materials must not be packed in the same outside container with corrosive liquids unless the corrosive liquids are in bottles, cushioned by incombustible absorbent material, in tightly closed metal containers.

NOTE 1: Oxidizing or other materials in quantity not exceeding 4 ounces, in securely closed metal cans, packed in the same compartment with other securely packed materials necessary for a complete fumigant, are acceptable for transportation.

(b) Closing and cushioning. All containers must be tightly and securely closed. Inside containers must be cushioned as prescribed or in any case when necessary to prevent breakage or leakage.

§ 173.153 LIMITED QUANTITIES OF FLAMMABLE SOLIDS, OXIDIZERS AND ORGANIC PEROXIDES.

(a) Limited quantities of flammable solids for which exceptions are permitted as noted by reference to this section in § 172.101 of this subchapter, are excepted from labeling and specification packaging requirements when packed according to the following paragraph. In addition, shipments are not subject to Part 172 or Part 177 of this subchapter.

(1) In inside containers not over 1 pound net weight each, in outside containers not exceeding 25 pounds net weight each.

(b) Limited quantities of oxidizers and organic peroxides for which exceptions are permitted as noted by reference to this section in § 172.101 of this subchapter are excepted from labeling and specification packaging requirements when packed according to the following paragraphs. In addition, shipments are not subject to Part 172 or Part 177 of this subchapter.

(1) Oxidizers in inside containers having a rated capacity of not over one pint for liquids or a net weight of not over one pound for solids, in strong outside packagings not exceeding 25 pounds net weight each.

(2) Organic peroxides, except acetyl benzoyl peroxide and benzoyl peroxide, as follows:

(i) In inside containers which must be securely packed and cushioned with noncombustible cushioning material (except that cushioning material is not required when the liquid is contained in strong, securely closed plastic packagings of not over 1 ounce by volume capacity each), further overpacked in strong outside packagings containing not over 1 pint or 1 pound net weight of the material.

(ii) In not more than 24 inside fiberboard containers each having not more than 70 securely closed tubes having a maximum fluid capacity each of 1/6-ounce and securely packed in noncombustible cushioning material.

(c) Special exceptions for shipment of certain flammable solids, oxidizers and organic peroxides in the ORM-D Class are provided in Subpart N of this part.

(Source: 17 Ill. Reg 4287, effective April 16, 1982)

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§ 173.154 FLAMMABLE SOLIDS, ORGANIC PEROXIDE SOLIDS AND OXIDIZERS NOT SPECIFICALLY PROVIDED FOR.

(a) Flammable solids, organic peroxide solids and oxidizers as defined in §§ 173.150 and 173.151, other than those for which special packing requirements are prescribed, must be packed in specification containers of a design and constructed of materials that will not react dangerously with or be decomposed by the chemical packed therein. Specific packaging requirements are as follows:

(1) Specs. 6A, 6B, or 6C (§§ 178.97, 178.98, or 178.99 of this chapter). Metal barrels or drums.

(2) Specs. 17C, 17E, 17H, 37A or 37B (§§ 178.115, 178.116, 178.118, 178.131, or 178.132 of this chapter), metal drums (single-trip).

(3) Spec. 57 (§ 178.253 of this subchapter). Portable tanks. Tanks must have a fusible plug having a fusing temperature between 70° C. and 90° C. Authorized only for dicumyl peroxide, dry and a, a' -bis(t-butylperoxy) diisopropylbenzene, solid.

(4) Specs. MC 303, MC 304, MC 306, MC 307, MC 311 or MC 312 (§§ 178.324, 178.325, 178.340, 178.341, 178.342, 178.331, 178.343 of this subchapter). Tank motor vehicles. Tanks must comply with § 178.340-8. Discharge valves must be located inside the tank or at a point outside the tank where the line enters or leaves the tank. The valve seat must be located inside the tank or within the welded flange, its companion flange, nozzle, or coupling. Each product discharge opening shall have a secondary closing means, remote from tank filling or discharge openings, for operation in event of fire or other accident. Tanks may have heating coils if an inorganic heating medium is used. Authorized only for sodium perchlorate or magnesium perchlorate, wet, with 10 percent or more of water, equally distributed within the cargo tank.

(5) (Reserved)

(6) Spec. 12B (§ 178.205 of this chapter). Fiberboard boxes with inside containers which must be metal cans; sliding-lid wooden boxes; fiber cans or boxes, spec. 2G (§ 178.26 of this chapter), not over 5 pounds capacity each; or glass bottles not over 1 pound capacity each. Packages containing glass containers must not weigh over 65 pounds gross.

(7) Specs. 15A or 15B (§§ 178.168 or 178.169 of this subchapter). Wooden boxes lined, specs. 2F or 2M (§§ 178.25 or 178.31 of this subchapter).

(8) Specs. 15A, 15B, 15C, 16A, or 19A (§§ 178.168, 178.169, 178.170, 178.185, or 178.190 of this subchapter). Wooden boxes with inside containers.

(9) Spec. 21C (§ 178.224 of this subchapter). Fiber drums. Authorized net weight not over 225 pounds.

(10) Spec. 22A (§ 178.196 of this subchapter). Plywood drums.

(11) Spec. 22B (§ 178.197 of this subchapter). Plywood drums with inside metal drums, spec. 2F (§ 178.25 of this subchapter).

(12) Spec. 12B (§ 178.205 of this subchapter). Fiberboard boxes constructed of at least 275 pound test double-faced fiberboard and provided with a perimeter liner and bottom pad of at least 200 pound test fiberboard. Boxes constructed of at least 350 pound fiberboard having top and bottom pads shall not require perimeter liner. Product must be contained within a tightly closed polyethylene or other equally efficient plastic bag constructed of material having minimum thickness of 0.004 inch. Not more than 25 pounds net weight of product may be packed in one outside box.

(13) Spec. 12A (§ 178.210 of this subchapter). Fiberboard boxes with inside glass bottles not over 5 pounds capacity each. Not more than four bottles having capacity of 5 pounds each, shall be packed in one outside container. Shipper must have established that completed package meets test requirements prescribed by § 178.210-10 of this subchapter.

(14) Spec. 12B (§ 178.205 of this subchapter). Fiberboard boxes with inside polyethylene bottles not over 1 gallon capacity each or polyethylene jars not over 9 pints capacity each. Each jar shall contain not more than 10 pounds net weight of product. Not more than four bottles or jars may be packed in one outside container. Authorized only for materials which will not cause decomposition of polyethylene or container failure.

(15) (Reserved)

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(16) Spec. 35 (§ 178.16 of this subchapter) non-reusable, removable head polyethylene drum for use without overpack and not over seven gallons capacity. Authorized only for dry or paste material that will maintain its form to a minimum temperature of 130° F.

(17) (Reserved)

(18) Specs. MC 307 or MC 311 (§§ 178.340, 178.342, 178.331 of this subchapter). Insulated tank motor vehicles designed for operation at temperatures up to 250° F. Authorized only for ammonium nitrate with 15 percent or more water in solution at a maximum temperature of 240° F.

(19) Specs. 6D or 37M (§§ 178.102, 178.134 of this subchapter). Cylindrical steel overpacks (non-reusable containers) with inside specs. 2S, 2SL, or 2U (§§ 178.35, 178.35a, 178.24 of this subchapter) polyethylene packaging.

(20) Aluminum or steel cargo tank motor vehicles or tight, sift-proof covered hopper-type motor vehicles. Vehicles must be thoroughly cleaned before loading. Authorized only for sodium chlorate, dry.

(Source: 7 Ill. Reg 3486, effective April 2, 1983)

§ 173.154a FUSEES.

(a) A fusee is a device designed to burn at a controlled rate and to produce visible effects for signaling purposes. It consists of a pasteboard or fiber tube containing a colored flare mixture and with or without a means of support. The composition of the fusee must be such that spontaneous ignition does not occur when the moistened composition is exposed to a temperature of 212° F. for 72 consecutive hours. Fusees must have individual tip, head, or similar ignition point or surface entirely covered and securely protected against accidental contact or friction. Fusees must be securely packed in packages complying with the following specifications:

(1) Specs. 15A, 15B, 15C, 16A, 19A, or 19B (§§ 178.168, 178.169, 178.170, 178.185, 178.190, 178.191 of this subchapter). Wooden boxes having a gross weight not to exceed 150 pounds for spec. 19B boxes; 200 pounds for the other boxes. When spec. 15C boxes are used, devices must be packed in airtight inside metal receptacles.

(2) Spec. 12B (§ 178.205 of this subchapter) fiberboard boxes. Boxes must have reinforced ends proven to be capable of preventing penetration of spikes through the outside box when a sample package, prepared as for shipment, is subjected to two drops from a height of 4 feet onto a solid surface. The package must be dropped so as to strike diagonally with the spikes in a downward position. Gross weight not to exceed 65 pounds except that gross weight not to exceed 75 pounds is authorized in boxes made in accordance with § 178.205-24 of this subchapter.

(3) Spec. 29 (§ 178.226 of this subchapter). Mailing tubes, provided the penetration of the spikes of the fusees through the outside container is prevented by the method specified for fiberboard boxes, spec. 12B, in subparagraph (2) of this paragraph. Gross weight not to exceed 5 pounds.

(4) Fusees without spikes when offered for shipment may be packed in packages prescribed in this paragraph, omitting the protection required for these devices when equipped with spikes.

(5) Fusees may be packed with non-explosive or nonflammable articles provided the outside packages are marked as prescribed in this section.

(b) Each outside package must be plainly marked in letters not less than 7/16-inch in height "Fusees" and with the additional words "Handle Carefully-Keep Fire Away."

§ 173.155 BAGS, NITRATE OF SODA, EMPTY AND UNWASHED.

(a) Bags, nitrate of soda, empty and unwashed, must be packed in specification containers as follows:

(1) Specs. 15A, 15B, 15C, 16A, or 19A (§§ 178.168, 178.169, 178.170, 178.185, or 178.190 of this subchapter). Wooden boxes.

(2) (Reserved)

(b) Bags in truckload lots loaded by consignor and to be unloaded by consignee may also be shipped loose or baled, provided the highway vehicle is lined with paper and provision is made to prevent entrance of sparks.

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§ 173.156 BARIUM PEROXIDE AND CALCIUM PEROXIDE.

(a) Barium peroxide and calcium peroxide must be packed in specification containers as follows:

(1) Specs. 15A, 15B, 15C, 16A or 19A (§§ 178.168, 178.169, 178.170, 178.185, or 178.190 of this subchapter). Wooden boxes with inside glass containers not over 1 pound capacity each; or with inside glass containers not over 5 pounds capacity each cushioned with incombustible cushioning material; or with inside metal containers or lining, spec. 2F (§ 178.25 of this subchapter).

(2) Spec. 6A (§ 178.97 of this subchapter). Metal barrels or drums. Gross weight not to exceed 880 pounds.

(3) Specs. 6B or 6C (§§ 178.98 or 178.99 of this subchapter). Metal barrels or drums with not more than 1400 pounds net weight in each container.

(4) Specs. 17E, 17H, 37A, or 37B (§§ 178.116, 178.118, 178.131, or 178.132 of this subchapter). Metal drums (single-trip).

(5) Spec. 21C (§ 178.224 of this subchapter). Fiber drums. Authorized net weight not over 225 pounds.

§ 173.157 BENZOYL PEROXIDE, CHLOROBENZOYL PEROXIDE (PARA), CYCLOHEXANONE PEROXIDE, DIMETHYLHEXANE DIHYDROPEROXIDE, LAUROYL PEROXIDE, OR SUCCINIC ACID PEROXIDE, WET.

(a) Benzoyl peroxide, chlorobenzoyl peroxide (para), dimethylhexane dihydroperoxide, lauroyl peroxide, and succinic acid peroxide, each wet with at least 30 percent of water by weight, and cyclohexanone peroxide over 50 percent concentration but not exceeding 85 percent concentration, wet, must be packed in specification packagings as follows:

(1) Specs. 15A, 15B, or 15C (§§ 178.168, 178.169, 178.170 of this subchapter). Wooden box with inside metal containers or lining, spec. 2F (§ 178.25 of this subchapter), or with securely closed inside paper bags lined with polyethylene at least 0.002 inch thick, or with inside aluminum drums of at least 16 gage metal throughout. Net weight (dry weight) in each inside DOT-2F metal container or in each paper bag may not exceed 1 pound. Gross weight may not exceed 200 pounds.

(2) (Reserved)

(3) Spec. 12B (§ 178.205 of this subchapter). Fiberboard box with inside fiber containers securely closed by taping or gluing, or with securely closed inside paper bags lined with polyethylene at least 0.002 inch thick. Net weight (dry weight) in each inside container may not exceed 1 pound. Except for lauroyl peroxide, wet, each inside container must be surrounded by asbestos or an equivalent fire-resistant cushioning material. Gross weight in spec. 12B65 fiberboard box may exceed 65 pounds, but may not exceed 80 pounds, provided the net weight (dry weight) of the contents does not exceed 50 pounds.

(4) Spec. 21C (§ 178.224 of this subchapter). Fiber drum with securely closed inside plastic containers made of polyethylene film at least 0.002 inch thick for cyclohexanone peroxide over 50 percent concentration but not exceeding 85 percent concentration and for dimethylhexane dihydroperoxide; with securely closed inside plastic containers made of polyethylene film at least 0.004 inch thick for benzoyl peroxide, wet with at least 30 percent of water by weight. Authorized net weight (wet weight) in one outside drum may not exceed 50 pounds for cyclohexanone peroxide, 100 pounds for dimethylhexane dihydroperoxide, or 225 pounds for benzoyl peroxide.

(5) Spec. 12B (§ 178.205 of this subchapter). Fiberboard box with securely closed inside plastic containers made of polyethylene film at least 0.004 inch thick. Net weight (dry weight) in each inside container may not exceed 10 pounds. Each inside container must be surrounded by asbestos or an equivalent fire-resistant cushioning material. Authorized only for benzoyl peroxide.

(b) Benzoyl peroxide, wet with at least 20 percent of water by weight, must be packed in specification packagings as follows:

(1) Spec. 12B (§ 178.205 of this subchapter). Fiberboard box with securely closed inside

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approved by the Bureau of Explosives. All match boxes, covers, and trays must be made of cardboard, wood, or metal, except that paper wrappings may be used for block or card matches.

(2) Individual containers must be wrapped in paper with not more than 12 boxes or individual containers in each paper-wrapped package, except that paper wrapping is not required for boxes that have a center holding or protecting strip of cardboard of the size and type detailed in subparagraph (3) of this paragraph placed over the matches in the manner specified or as otherwise provided herein. Paper-wrapped packages must be secured on the ends and on the lapping side with glue, or similar satisfactory adhesive making each 12 boxes or less of matches a serviceably wrapped and well secured packages. Chipboard or fiberboard boxes constructed of material not less than 0.018 inch thick, having flaps secured by adhesive or closed by specially designed flaps or tabs formed to secure tight closures, are not required to be wrapped in paper.

(3) No individual container (not including card or block matches) shall contain more than 700 strike-anywhere matches in any one container, box, or package. When more than 300 matches are packed in any individual container, box, or package, the matches must be arranged in two nearly equal portions with the heads of the two portions placed in opposite directions. All individual containers containing 350 or more matches must have placed over the matches a center holding or protecting strip made of cardboard, which can be scored or bent without fracture, except the center holding strip shall not be required when matches are packed in chipboard or fiberboard boxes detailed in subparagraph (2) of this paragraph. This protecting strip shall be not less than 1-1/4 inches wide and shall be flanged down at least 5/8-inch on each end to hold the matches in position when the container is nested into the shuck or cover or withdrawn therefrom.

(d) Matches, unless exempted in paragraph (g) or (h) of this section, must be packaged as follows:

(1) Spec. 15A (§ 178.168 of this subchapter). Wooden boxes, with inside containers; not over 100 pounds each.

(2) Specs. 12B or 12C (§§ 178.205 or 178.206 of this subchapter). Fiberboard boxes with inside containers; not over 60 pounds each. Fill-in pieces specified by §§ 178.205-14 or 178.206-14 of this subchapter shall not be required.

(3) The maximum number of match boxes contained in any one case shall be as follows:

Number of boxes	Nominal number of matches per box
1/2 gross -----	Not over 700.
1 gross -----	Not over 500.
2 gross -----	Not over 400.
3 gross -----	Not over 300.
5 gross -----	Not over 200.
12 gross -----	Not over 100.
20 gross -----	Over 50, under 100.
25 gross -----	Not over 50.

(e) (Reserved)

(f) Marking. Outside containers of strike-anywhere matches shall show the name of the importer, distributor, or manufacturer and the brand or trademark under such matches are manufactured and distributed to the trade. The name shall be printed in English.

(1) In addition, and separate therefrom, all outside containers shall have plainly marked thereon the words "STRIKE-ANYWHERE MATCHES".

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(g) Matches, strike-on-box, book, and card are not subject to this subchapter if packed with no other articles in outside fiberboard or wooden boxes.

(h) Limited quantities of matches, strike-on-box, book, and card when packaged in outside fiberboard or wooden boxes may be packed in the same outside packaging with nonflammable materials. They must be compactly packed in tightly closed inside packagings or securely wrapped to prevent accidental ignition. When so packed, they are excepted from labeling and specification packaging requirements of this subchapter. The outside of each package must be marked "BOOK MATCHES," "STRIKE-ON-MATCHES," or "CARD MATCHES," as appropriate. In addition, shipments are not subject to Part 172 or Part 177 of this subchapter.

§ 173.177 MOTION-PICTURE FILM AND X-RAY FILM.

(a) Motion-picture film and X-ray film (nitrocellulose base) must be packed in specification containers as follows:

(1) Specs. 32A or 32B (§§ 178.146 or 178.147 of this subchapter). Metal cases.

(2) Specs. 15A, 15B, or 15C (§§ 178.168, 178.169, or 178.170 of this subchapter). Wooden boxes with each reel in a tightly closed metal can, or strong cardboard or fiberboard box with cover held in place by adhesive tape or paper; gross weight not over 200 pounds.

(3) Spec. 12B (§ 178.206 of this subchapter). Fiberboard boxes complying with § 178.205-22 (a) (1) of this subchapter; authorized for a single tightly closed inside metal can or strong cardboard or fiberboard box with cover held in place by adhesive tape or paper, not over 2,000 feet of film. Taped closure authorized.

(4) Spec. 12B (§ 178.205 of this subchapter). One-piece fiberboard boxes complying with § 178.205-22 (a) (2) of this subchapter; authorized only when each film is in a tightly closed metal film-reel can or strong cardboard or fiberboard box with cover held in place by adhesive tape or paper containing not over 2,000 feet (approximately) of film; cans or boxes to be adequately braced in center of box by fiberboard, at least 175 pound test, extending full depth of box. Gross weight not over 65 pounds. Closing of box must be effected by coating entire contact surfaces of flaps with efficient adhesive; stitched closure not authorized. Boxes that have been filled, shipped, and opened, are not authorized for reuse.

(5) Spec. 32C (§ 178.148 of this subchapter). Trunks with each film in standard metal film-reel can or strong cardboard or fiberboard box with cover held in place by adhesive tape or paper. Trunks to contain no material other than films in cans or boxes and projecting apparatus. The apparatus, as packed, must not be capable of creating an electric current.

(6) Spec. 12B (§ 178.205 of this subchapter). Fiberboard boxes complying with § 178.205-27 of this subchapter; authorized only for not more than two square inside metal cans containing not over 200 feet (approx.) of film each; gross weight not over 15 pounds. Taped closure authorized.

(b) Slow burning motion-picture film is excepted from the requirements of this subchapter, except when packed with flammable film.

§ 173.178 CALCIUM CARBIDE.

(a) Calcium carbide must be packed as follows:

(1) In water-tight metal drums with rolled, folded top and bottom seams and with welded side seams. Closures must be of the friction-type or screw-type. Full open-top closures must be gasketed and equipped with leverlock or bolted clamping ring. Maximum rated capacity may not exceed 55 gallons.

(2) In water-tight, sift-proof, bulk metal containers.

(3) (Reserved)

(4) In water-tight, sift-proof, closed-top metal covered hopper motor vehicles.

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§ 173.179 N-methyl-N'-nitro-N-nitrosoguanidine.

N-methyl-N'-nitro-N-nitrosoguanidine must be packaged as follows: The quantity in one outside packaging may not exceed 25 grams and must be placed in a polyethylene bottle which is tightly closed and the closure secured in place with pressure sensitive tape. The bottle must be sealed in a polyethylene bag constructed of polyethylene at least 4 mils thick. The bag containing the bottle must be cushioned in a hermetically sealed can with noncombustible cushioning material. There must be at least one inch of cushioning material between the outer surface of the bag and the inner surface of the can. The metal can must be cushioned in a DOT 12B fiberboard box constructed of at least 350 pound test fiberboard. There must be at least one inch of cushioning material the outer surface of the can and the inner surface of the fiberboard box.

(Source: 7 Ill. Reg 3486, effective April 2, 1983)

§§ 173.180-173.181 (RESERVED)

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§ 173.182 NITRATES.

(a) Aluminum nitrate, ammonium nitrate (no organic coating), ammonium nitrate (organic coating), ammonium nitrate-carbonate mixture, ammonium nitrate-phosphate, ammonium nitrate fertilizer,¹ (containing no more than 0.2 percent carbon), ammonium nitrate mixed fertilizer, barium nitrate, beryllium nitrate, calcium nitrate, cupric nitrate, ferric nitrate (NOTE: The double salt of calcium and ammonium nitrate $5\text{Ca}(\text{NO}_3)_2\text{NH}_4\text{NO}_3 \cdot 10\text{H}_2\text{O}$) containing not more than 15.5 percent nitrogen and at least 12 percent water is not subject to the regulations in this subchapter), guanidine nitrate, lead nitrate, magnesium nitrate, mercuric nitrate, nickel nitrate, nitrates, n.o.s., nitrate of soda and potash, potassium nitrate, silver nitrate, sodium nitrate, and strontium nitrate and zirconium nitrate must be packaged as follows:

(1) In wooden or fiberboard boxes with glass, metal, or other strong inside containers; in metal or fiber drums; in kegs or barrels; or in strong metal cans. When so packed, they are excepted from the specification packaging requirements of this Part.

(b) Aluminum nitrate, ammonium nitrate (no organic coating), ammonium nitrate-carbonate mixture, ammonium nitrate-phosphate, ammonium nitrate fertilizer¹ (containing no more than 0.2 percent carbon) ammonium nitrate mixed fertilizer, barium nitrate, beryllium nitrate, calcium nitrate, cupric nitrate, ferric nitrate, guanidine nitrate, mercuric nitrate, nickel nitrate, nitrate of soda and potash, potassium nitrate, sodium nitrate, and strontium nitrate, and zirconium nitrate, in addition to containers prescribed in paragraph (a) of this section, may be packaged as follows:

(1) (Reserved)

(2) In bulk, in sift-proof closed or open type motor vehicles.

(3) (Reserved)

(4) In burlap bags not exceeding 200 pounds net weight, water-resistant, made tight against sifting, and made of not less than 7-1/2 ounce burlap.

(5) Multiple-wall paper bags must be constructed as follows:

(i) At least 4-ply including moisture-barrier ply, and made tight against sifting. Maximum authorized net weight is 110 pounds. Completed package, filled to weight with product and closed for shipment, must be capable of withstanding three 4-foot drops on face or back onto solid concrete without rupture.

(ii) At least 3-ply of extensible Kraft paper having a minimum total basis weight of 180 pounds including an innermost ply coated with polyethylene to provide a moisture barrier. Maximum authorized net weight is 80 pounds. Completed package, filled to weight with product and closed for shipment, must be capable of withstanding three 4-foot drops on face or back onto solid concrete without rupture.

(6) Plastic bags must be constructed as follows:

(i) Spec. 44P (§ 178.241 of this subchapter). All plastic bags. Maximum authorized net weight is 81 pounds. Authorized only for ammonium nitrate mixed fertilizer, ammonium nitrate fertilizer (containing no more than 0.2 percent carbon), and potassium nitrate.

(ii) Polypropylene bag made of 9 denier polypropylene fibers spun continuously to form a sheet weighing at least 3-1/2 ounces per square yard. Maximum authorized net weight is 100 pounds. Each bag must have an inner liner of polyethylene not less than 4 mils thick. Each bag filled to weight with product and closed for shipment must be capable of withstanding three 4-foot drops on face or back onto solid concrete without rupture. Authorized only for ammonium nitrate (no organic coating) and ammonium nitrate fertilizer; or

(iii) Polyethylene bag made of two plies of high-density polyethylene film laminated together so that the orientation of each ply of film is at right angles to the other. Maximum authorized net weight is 100 pounds. For a net weight not exceeding 50 pounds, the thickness of each bag must be at least 2.5 mils. For a net weight exceeding 50 pounds but not exceeding 100 pounds, the thickness of each bag must be at least 4 mils. Each bag must be capable of withstanding the test requirements of § 178.241-4 and each bag must be in compliance with the requirements of

¹ Applies only to materials tested in accordance with and meeting the definition in The Fertilizer Institute's publication "Definition and Test Procedures for Ammonium Nitrate Fertilizer" dated May 7, 1971.

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§ 178.241-3 of this subchapter for bag closures. Authorized only for ammonium nitrate (no organic coating), ammonium nitrate fertilizer, and sodium nitrate.

(7) Specs. 53² or 56 (§§ 178.251, 178.252 of this subchapter). Portable tank. Authorized only for sodium nitrate.

(Source: 7 Ill. Reg 3486, effective April 2, 1983)

§ 173.183 POTASSIUM NITRATE MIXED (FUSED) WITH SODIUM NITRITE.

(a) Potassium nitrate mixed (fused) with sodium nitrite must be packed in containers as follows:

(1) In containers as prescribed in § 173.182 (a).

§ 173.184 NITROCELLULOSE OR COLLODION COTTON, WET, OR NITROCELLULOSE, COLLOIDED, GRANULAR, OR FLAKE, WET, OR NITROSTARCH, WET, OR NITROGUANIDINE, WET.

(a) Nitrocellulose or collodion cotton, wet, or nitrocellulose, colloided, granular, or flake, wet, or nitrostarch, wet, or nitroguanidine, wet, must be uniformly wet with at least 20 pounds of water to 80 pounds of dry material and must be packed in specification containers as follows:

(1) (Reserved)

(2) Specs. 14, 15A, or 15B (§§ 178.165, 178.168, or 178.169 of this subchapter). Wooden boxes lined, spec. 2M (§ 178.31 of this subchapter).

(3) Specs. 6A, 6B, 6C, or 6J (§§ 178.97, 178.98, 178.99, or 178.100 of this subchapter). Metal barrels or drums not over 55 gallons capacity. Spec. 6J (§ 178.100 of this subchapter) drums must have removable heads of 14 gauge metal or 16 gauge metal with one or more corrugations near the periphery and heads must have a minimum convexity of 3/8-inch; each drum must have three rolled or swedged-in hoops, one of which shall be in the body near the top curl.

(4) Specs. 37A or 37B (§§ 178.131 or 178.132 of this subchapter). Metal drums (single-trip not over 5 gallons capacity. Welded side seams required.

(5) Specs. 17E or 17H (§§ 178.116 or 178.118 of this subchapter). Metal drums (single-trip).

(6) Spec. 42F (§ 178.110 of this subchapter). Aluminum barrels or drums.

(b) Gross weight of any container must not exceed 490 pounds.

§ 173.185 PAPER STOCK, WET.

Paper stock, wet, must be packed in hermetically sealed metal-lined wooden boxes or air-tight metal containers.

§ 173.186 PAPER WASTE, WET.

Paper waste, wet, must be packed in hermetically sealed metal-lined wooden boxes or air-tight metal containers except that paper waste, wet, free from oil or other foreign matter liable to cause spontaneous ignition may be shipped in tight bales.

(Source: 17 Ill. Reg 4287, effective April 16, 1982)

§ 173.187 PEROXIDE OF SODIUM.

(a) Peroxide of sodium must be packed in specification containers as follows:

(1) Specs. 15A, 15B, 15C, 16A, or 19A (§§ 178.168, 178.169, 178.170, 178.185, 178.190 of this subchapter). Wooden boxes with inside containers which must be air-tight metal cans.

(2) Specs. 6A, 6B, or 6C (§§ 178.97, 178.98, or 178.99 of this subchapter). Metal barrels or drums.

(3) Specs. 17E, 17H, 37A, or 37B (§§ 178.116, 178.118, 178.131, or 178.132 of this subchapter). Metal drums (single-trip).

² Use of existing tanks authorized. Construction not authorized after May 31, 1972.

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and shall be of material which will not react with or be decomposed when in contact with contents. Screw-cap closures must be secured in place by suitable tape. Each glass or polyethylene container must be surrounded on all sides with not less than 1 inch of incombustible cushioning material and in an amount sufficient to completely absorb the entire liquid contents of the containers. Each inside glass or polyethylene container must be placed in a spec. 2A (§ 178.20 of this subchapter) metal can closed with push-in cover held in place by soldering or crimping at least four points. Authorized net weight of hafnium in one outside container shall not exceed 40 pounds for wooden boxes and shall not exceed 150 pounds for steel drums.

(2) (Reserved)

(b) Hafnium metal, dry, in an atmosphere of inert gas, mechanically produced finer than 270 mesh particle size or chemically produced finer than 20 mesh particle size must be packed in specification containers as follows:

(1) Specs. 6A, 6B, or 6C (§§ 178.97, 178.98, or 178.99 of this subchapter) or specs. 17C, 17H, or 37A (single-trip containers) (§§ 178.115, 178.118, or 178.131 of this subchapter). Metal barrels or drums with inside non-carbon polyethylene bottles having positive type clamp-on closures equipped with rubber gaskets, or with screw-cap closures having not less than three continuous threads and equipped with gaskets ahead of threads, not over 5 pounds net weight capacity each. Screw-cap closures must be secured in place by suitable tape. Each bottle must be placed in a spec. 2R (§ 178.34 of this subchapter) metal container having a wall thickness of one-fourth inch and be completely surrounded by cushioning material. Spec. 2R containers must be separated from one another by incombustible cushioning material. Authorized net weight of metal in one outside container not over 150 pounds.

(c) Zirconium metal, wet, mechanically produced finer than 270 mesh particle size or chemically produced finer than 20 mesh particle size with a minimum of 25 percent water by weight (a mixture of water and a suitable anti-freeze agency may be used when freezing temperatures may be encountered during transportation) must be packed in specification containers as follows:

(1) Specs. 15A or 15B (§§ 178.168, or 178.169 of this subchapter) wooden boxes or specs. 6A, 6B, or 6C (§§ 178.97, 178.98, or 178.99 of this subchapter) or 17C or 17H (single-trip containers) (§§ 178.115 or 178.118 of this subchapter) metal drums with inside containers of glass or non-carbon polyethylene having net weight of not over 10 pounds each. Inside glass containers must be equipped with positive type clamp-on closures equipped with rubber gaskets. Inside polyethylene containers may have screw-cap closures equipped with gaskets ahead of thread and shall be of material which will not react with or be decomposed when in contact with contents. Screw-cap closures must be secured in place by suitable tape. Each glass or polyethylene container must be surrounded on all sides with not less than 1 inch of incombustible cushioning material and in an amount sufficient to completely absorb the entire liquid contents of the containers. Each inside glass or polyethylene container must be placed in a spec. 2A (§ 178.20 of this subchapter) metal can closed with push-in cover held in place by soldering or crimping at least four points. Authorized net weight of zirconium in one outside container shall not exceed 40 pounds in wooden boxes and 150 pounds in steel drums.

(2) (Reserved)

(3) Spec. 37P (§ 178.133 of this subchapter). Steel drums with polyethylene liner of one-piece molded construction (nonreusable container) not over 5 gallons capacity each. Drums exceeding 1 gallon capacity must be constructed of at least 24 gauge metal.

(4) Spec. 37M (§ 178.134 of this subchapter). Cylindrical steel overpack with inside spec. 2S (§ 178.35 of this subchapter) polyethylene container. Each overpack must be constructed of at least 24 gauge steel. Each packaging may not exceed a capacity of 5 gallons. Net weight of contents may not exceed 50 pounds of dry material.

(5) Spec. 6D (§ 178.102 of this subchapter). Cylindrical steel overpack with inside spec. 2S (§ 178.35 of this subchapter) noncarbon polyethylene container. Container is limited to single trip only and may not exceed a capacity of 5 gallons. Net weight of contents must not exceed 50 pounds of dry material.

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(d) Zirconium metal, dry, in an atmosphere of inert gas, mechanically produced finer than 270 mesh particle size or chemically produced finer than 20 mesh particle size must be packed in specification containers as follows:

(1) Specs. 6A, 6B, or 6C (§§ 178.97, 178.98, or 178.99 of this subchapter) or specs. 17C, 17H, or 37A (single-trip containers) (§§ 178.115, 178.118, or 178.131 of this subchapter). Metal barrels or drums with inside non-carbon polyethylene bottles having positive type clamp-on closures equipped with rubber gaskets, or with screw-cap closures having not less than three continuous threads and equipped with gaskets ahead of threads, not over 5 pounds net weight capacity each. Screw-cap closures must be secured in place by suitable tape. Each bottle must be placed in a spec. 2R (§ 178.34 of this subchapter) metal container having a wall thickness of one-fourth inch and be completely surrounded by cushioning material. Spec. 2R containers must be separated from one another by incombustible cushioning materials. Authorized net weight of metal in one outside container not over 150 pounds.

(e) Mechanically produced hafnium metal, coarser than 270 mesh particle size and chemically produced coarser than 20 mesh particle size in strong tight containers are not subject to Parts 170-179 of this subchapter.

(f) Mechanically produced zirconium metal, coarser than 270 mesh particle size and chemically produced coarser than 20 mesh particle size in strong tight containers are not subject to Parts 170-179 of this subchapter. (See § 173.220, zirconium scrap).

(Source: 17 Ill. Reg 4287, effective April 16, 1982)

§ 173.215 (RESERVED)

§ 173.216 ZIRCONIUM PICRAMATE, WET.

(a) Zirconium picramate must be wet with not less than 20 percent of water by weight and packed in specification containers as follows:

(1) Specs. 15A, 15B, 15C, 16A, or 19A (§§ 178.168, 178.169, 178.170, 178.185, or 178.190 of this subchapter). Wooden boxes with well stoppered glass inside containers of not exceeding 1 quart capacity each, cushioned in the boxes.

§ 173.217 CALCIUM HYPOCHLORITE, HYDRATED; CALCIUM HYPOCHLORITE MIXTURE, DRY; LITHIUM HYPOCHLORITE MIXTURE, DRY; MONO-(TRICHLORO) TETRA - (MONOPOTASSIUM DICHLORO)-PENTA-S-TRIAZINETRIONE, DRY; POTASSIUM DICHLORO-S-TRIAZINETRIONE, DRY; SODIUM DICHLORO-S-TRIAZINETRIONE, DRY; TRICHLORO-S-TRIAZINETRIONE, DRY.

(a) Calcium hypochlorite, hydrated; calcium hypochlorite mixture, dry, lithium hypochlorite mixture, dry, mono-(trichloro) tetra-(monopotassium dichloro)-penta-s-triazinetriene, dry, potassium dichloro-s-triazinetriene, dry, sodium dichloro-s-triazinetriene, dry, and trichloro-s-triazinetriene, dry, each containing more than 39 percent available chlorine must be packaged as follows:

(1) Specs. 6A, 6B, or 6C (§§ 178.97, 178.98, or 178.99 of this subchapter). Metal barrels or drums.

(2) Specs. 17E, 17H, 37A, or 37B (§§ 178.116, 178.118, 178.131, or 178.132 of this subchapter). Metal drums (single-trip).

(3) Spec. 21C (§ 178.224 of this subchapter). Fiber drums with inner ply a laminated sheet of paper and aluminum foil, internally coated with not less than a 0.002 inch thickness of polyethylene. Cover of drum shall be gasketed. Authorized net weight not over 400 pounds.

(4) Spec. 21C (§ 178.224 of this subchapter). Fiber drum with commodity packed in securely closed polyethylene bag constructed of polyethylene film not less than 0.004 inch thickness. Not authorized for calcium hypochlorite mixtures and lithium hypochlorite compounds, dry.

(5) Spec. 21C (§ 178.224 of this subchapter). Fiber drum must be made with integral inner body ply having 0.003-inch minimum thickness aluminum facing and bottom inner ply having 0.001 inch minimum thickness aluminum facing. Cover of drum must be gasketed. Authorized net weight not over 400 pounds. Authorized only for dry calcium hypochlorite mixtures.

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(6) Spec. 56 (§§ 178.251, 178.252 of this subchapter). Metal portable tank. Authorized only for mono-(trichloro) tetra-(monopotassium dichloro)-penta-s-triazinetriene, dry; potassium dichloro-s-triazinetriene, dry; sodium dichloro-s-triazinetriene, dry; and trichloro-s-triazinetriene, dry.

(7) Spec. 35 (§ 178.16 of this subchapter) non-reusable, removable head polyethylene drum for use without overpack and not over seven gallons capacity.

(8) Spec. 12B (§ 178.205 of this subchapter). Fiberboard boxes with inside polyethylene bottles with a minimum wall thickness of 0.015 inch. Not more than 2 polyethylene bottles may be packed in one box and each bottle shall contain not more than 16 pounds net weight of commodity. Container must be such that it will not react dangerously with or be decomposed by the commodity.

(9) Spec. 12B (§ 178.205 of this subchapter). Fiberboard box with not more than two inside minimum 30 gauge thick steel pails containing not over 26 pounds net weight each. Each cover must be gasketed.

(b) As prescribed in § 173.163(a)(7). Authorized only for calcium hypochlorite, hydrated.

(c) Limited quantities of these materials in strong outside wooden or fiberboard packages with inside packagings of glass not over 5 pounds capacity each, or with inside metal packagings or plastic bottles or drums not over 10 pounds capacity each, are excepted from labeling and the specification packaging requirements of this subchapter. In addition, shipments are not subject to subpart F of Part 172 and Part 177 of this subchapter.

(Source: 7 Ill. Reg 3486, effective April 2, 1983)

§ 173.218 ISOPROPYL PERCARBONATE, UNSTABILIZED.

(a) Isopropyl percarbonate, unstabilized, must be packed in specification containers as follows:

(1) Specnt containers when approved by the Bureau of Explosives, with glass, metal, or earthenware inside containers of not over 2 gallons capacity each which must be maintained at a temperature below 0° F. Shipments are authorized for transportation by private or contract carrier by motor vehicle only.

§ 173.219 POTASSIUM PERCHLORATE.

(a) Potassium perchlorate must be packed as follows:

(1) As prescribed in § 173.154 (a) (1) to (a) (11) and (a) (14). Plastic bottles may be substituted for the inside glass bottles prescribed in § 173.154 (a) (6).

(Source: 17 Ill. Reg 4287, effective April 16, 1982)

§ 173.220 MAGNESIUM OR ZIRCONIUM SCRAP CONSISTING OF BORINGS, CLIPPINGS, SHAVINGS, SHEETS, TURNINGS, OR SCALPINGS, AND MAGNESIUM METALLIC (OTHER THAN SCRAP), POWDERED, PELLETS, TURNINGS, OR RIBBON.

(a) Magnesium or zirconium scrap consisting of borings, shavings, or turnings, must be packed in closed metal barrels or drums, wooden barrels, metal pails, fiber drums, or four-ply paper bags. Paper bags are not authorized for less-than-truckload shipments.

(1) Magnesium or zirconium scrap consisting of clippings, scalpings, or scrap sheets may be shipped in bulk in truckload quantities. Trucks or trailers must have closed or completely covered bodies.

(2) Limited quantities of magnesium or zirconium scrap consisting of clippings, scalpings, or scrap sheets in closed metal drums, wooden barrels, or wooden boxes, unless otherwise provided is excepted from labeling and specification packaging requirements of this subchapter. In addition, shipments are not subject to Part 172 or Part 177 of this subchapter.

(b) Magnesium metallic (other than scrap), powdered, pellets, turnings, or ribbon must be packed in containers as prescribed in § 173.154.

(1) Limited quantities of magnesium metallic (other than scrap), pellets, turnings, or

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ribbon in fiberboard boxes with inside glass bottles not over 1 pound capacity each, with not more than 25 pounds net weight of product in each outside fiberboard box, in closed metal drums, metal pails, fiber drums, or wooden boxes with inside packagings are, unless otherwise provided excepted from labeling and the specification packaging requirements of this subchapter. In addition, shipments are not subject to Part 172 or Part 177 of this subchapter.

(2) Spec. 56 (§ 178.252 of this subchapter). Portable tank. For magnesium powder, the following additional requirements must also be met:

(i) The tank must be pressurized with 2 psig of nitrogen before shipment and the pressure relief valve must have a maximum setting of 3 psig; and

(ii) The tank must have both a sift-proof valve with a locking pin and a plug or blind flange on the bottom opening.

§ 173.221 LIQUID ORGANIC PEROXIDES, N.O.S., AND LIQUID ORGANIC PEROXIDE SOLUTIONS, N.O.S.

(a) Liquid organic peroxides, n.o.s., and liquid organic peroxide solutions, n.o.s must be packed in packagings which may be equipped with venting devices wherever necessary to prevent excessive pressure buildup, as follows:

(1) Specs. 1A, 1D, or 1M (§§ 178.1, 178.4, 178.17 of this subchapter). Glass carboys in boxes or expanded polystyrene packagings. Rated capacity may not exceed 5 gallons for spec. 1A.

(2) Specs. 15A, 15B, 15C, 16A, or 19A (§§ 178.168, 178.169, 178.170, 178.185, or 178.190 of this subchapter). Wooden boxes with inside containers which must be glass, earthenware, or metal, not over 1 gallon each, cushioned with incombustible packing material in sufficient quantity to absorb the contents of the inner container. Metal inside containers authorized only for materials which will not react dangerously with or be decomposed by contact with metal.

(3) Spec. 12B (§ 178.205 of this subchapter). Fiberboard box with spec. 2E (§ 178.24a of this subchapter) inside polyethylene bottles, or with glass or metal inside receptacles, not over 1 gallon each. Not more than six 1 gallon polyethylene bottles may be packed in one fiberboard box. Not more than one 1 gallon glass or metal inside receptacle, which must be cushioned with noncombustible packing material in sufficient quantity to absorb the contents of the inner receptacle, may be packed in one fiberboard box. Metal and polyethylene inside receptacles authorized only for material which will not react dangerously with or be decomposed by contact with metal or polyethylene.

(4) Spec. 42B (§ 178.107 of this subchapter). Aluminum drums not over 15 gallons capacity. Authorized only for peroxides which will not react dangerously with the aluminum or be decomposed by contact with it.

(5) Specs. 17C or 17E (§§ 178.115 or 178.116 of this subchapter). Metal drums (single-trip) not over 15 gallons capacity. Authorized only for material which will not react dangerously with the drum metal, or be decomposed by contact with it.

(6) Spec. 22C (§ 178.198 of this subchapter). Plywood drum as prescribed by § 178.198-2 (a) of this subchapter, with inside spec. 2T (§ 178.21 of this subchapter) polyethylene container. Authorized only for material which will not react dangerously with or cause decomposition of the polyethylene.

(7) Specs. 6D or 37M (nonreuseable container) (§§ 178.102, 178.134 of this subchapter). Cylindrical steel overpacks with inside §§ 2S or 2SL (§§ 178.35, 178.35a of this subchapter) polyethylene containers. Authorized only for materials which will not react dangerously with or cause decomposition of the polyethylene.

(8) Spec. 37P (§ 178.133 of this subchapter). Steel drums, not over 5 gallons capacity, with one-piece seamless molded polyethylene liner (nonreusable container). Drums exceeding 1 gallon capacity must be constructed of at least 24 gauge metal. Authorized only for materials that will not react with polyethylene and result in container failure.

(9) Spec. 12P (§ 178.211 of this subchapter). Fiberboard boxes with inside spec. 2U (§ 178.24 of this subchapter) polyethylene containers not over 6 gallon capacity each. Wire staples are not authorized for assembly or closure of boxes, except when polyethylene container

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(2) Corrosive liquids in metal or plastic containers having a rated capacity not over 16 ounces by volume in strong outside packaging.

(3) Corrosive solids in earthenware, glass, plastic, or paper containers of not more than 5 pounds capacity each packed in metal, wooden or fiberboard outside packaging not exceeding 25 pounds net weight each.

(4) Corrosive solids in metal, rigid fiber or composition cans or cartons or rigid plastic containers; of not more than 10 pounds capacity each, overpacked in metal, wooden or fiberboard outside containers not exceeding 25 pounds net weight each.

(b) Special exceptions for shipment of certain corrosive materials in the ORM-D class are provided in Subpart N of this Part.

§ 173.245 CORROSIVE LIQUIDS NOT SPECIFICALLY PROVIDED FOR.

(a) Corrosive liquids, as defined in § 173.240, other than those for which special requirements are prescribed, must be packed in specification containers constructed of materials that will not react dangerously with or be decomposed by the chemical packed therein, as follows:

(1) Spec. 1A (§ 178.1 of this subchapter). Glass carboys in boxes.

(2) Spec. 1X (§ 178.5 of this subchapter). Boxed carboys; single-trip for export only. For shipment by common carriers by water to noncontiguous territories or possessions of the United States and foreign countries; shipments from inland points in the United States which are consigned to such destinations are authorized to be transported to ship side in truckload lots only.

(3) Specs. 1D or 1M (§§ 178.4, 178.17 of this subchapter). Glass carboys in boxes or expanded polystyrene packagings. Pressure in the carboy may not exceed 10 pounds per square inch at 130° F. (55° C.). If the package is vented, there may be no significant release of contents to the environment.

(4) Specs. 5A, 5B, 5C, or 5M (§§ 178.81, 178.82, 178.83, 178.90 of this subchapter). Metal barrels or drums.

(5) Spec. 5K (§ 178.83 of this subchapter). Nickel barrels or drums. Authorized only for commodities that will not react with nickel and result in container failure.

(6) (Reserved)

(7) Specs. 15A, 15B, 15C, 16A, or 19A (§§ 178.168, 178.169, 178.170, 178.185, or 178.190 of this subchapter). Wooden boxes with inside containers which must be glass, earthenware, polyethylene or other nonfragile plastic material (bags are not authorized), not over 1 gallon each, except that inside containers up to 3 gallons are authorized when only one is packed in each outside container.

(8) Spec. 28 (§ 178.8 of this subchapter). Metal-jacketed lead carboys.

(9) Spec. 5D (§ 178.84 of this subchapter). Rubber lined metal barrels or drums. Any barrel or drum that shows evidence of damage must be tested before shipment for defects in lining in the manner prescribed in § 178.84-15 (a) of this subchapter.

(10) Spec. 5H (§ 178.87 of this subchapter). Lead-lined metal barrels or drums.

(11) Spec. 43A (§ 178.18 of this subchapter). Rubber drums.

(12) Spec. 12B (§ 178.205 of this subchapter). Fiberboard boxes with inside containers of polyethylene, or other non-fragile plastic material resistant to the lading, and having threaded closures or other equally efficient type closure, not over 1 gallon capacity each, suitably cushioned to prevent movement within the box. Gross weight of complete package must not exceed 65 pounds.

(13) Specs. 15P or 22C (§ 178.182 or 178.198 of this subchapter). Glued plywood or wooden box, or plywood drum as prescribed by § 178.198-2(a) of this subchapter, with spec. 2T (§ 178.21 of this subchapter) polyethylene container.

(14) Specs. 17C, 17E, or 17F (§§ 178.115, 178.116, or 178.117 of this subchapter). Metal drums (single-trip) with openings not exceeding 2.3 inches in diameter.

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(15) Spec. 17H (§ 178.118 of this subchapter). Metal drums (single-trip). Authorized for viscous cleaning compounds, liquid, only.

(16) Specs. 6D or 37M (nonreusable container) (§§ 178.102, 178.134 of this subchapter). Cylindrical steel overpacks with inside specs. 2S, 2SL, or 2U (§§ 178.35, 178.35a, 178.24 of this subchapter) polyethylene packaging.

(17) Specs. 17H, 37A, or 37B (§§ 178.118, 178.131, or 178.132 of this subchapter), metal drums (single-trip), with welded side seams, not over 5 gallons capacity each. Drums must be lined throughout with a pliable plastic material impervious to the lading. Specs. 37A and 37B metal drums must be at least 24 gauge steel.

(18) Spec. 12A (§ 178.210 of this subchapter). Fiberboard boxes with inside glass, polyethylene, or other non-fragile plastic bottles not over 5-quart capacity each. Not more than 4 inside glass bottles exceeding 5-pint capacity each shall be packed in the outside container. Shipper must have established that the completed package meets test requirements prescribed by § 178.210-10 of this subchapter.

(19) Spec. 37P (§ 178.133 of this subchapter). Steel drum with polyethylene liner (non-reusable container). Authorized only for materials that will not react with polyethylene and result in container failure.

(20) Spec. 16D (§ 178.187 of this subchapter). Wirebound wooden overwrap, with inside specs. 2T, 2TL, 2S, or 2SL (§§ 178.21, 178.27, 178.35, 178.35a of this subchapter) polyethylene container.

(21) Spec. 12P (§ 178.211 of this subchapter). Fiberboard boxes with inside spec. 2U (§ 178.24 of this subchapter) polyethylene containers not over 5 gallons capacity each. Wire staples are not authorized for assembly or closure of boxes, except when polyethylene container is completely enclosed in inside boxes free of wire staples or other projections that could cause failure.

(22) Spec. 16A (§ 178.185 of this subchapter). Wirebound wooden box (§ 178.185-22 of this subchapter) with inside spec. 2U (§ 178.24 of this subchapter) polyethylene container. The polyethylene container must be separated from the wooden box by a complete corrugated fiberboard liner and top and bottom pads.

(23) Spec. 12B (§ 178.205 of this subchapter). Fiberboard boxes with inside polyethylene bottles, not over 5 gallons capacity each, as specified by § 178.205-34 of this subchapter. Not more than one bottle shall be packed in one outside box.

(24) Spec. 21P (§ 178.225 of this subchapter). Fiber drum overpack with inside specs. 2S, 2SL, or 2U (§§ 178.35, 178.35a, or 178.24 of this subchapter) polyethylene container.

(25) Specs. 12A or 12B (§§ 178.210 or 178.205 of this subchapter). Fiberboard boxes with inside aluminum containers not over 5 pounds capacity each. Aluminum containers must be approved by the Bureau of Explosives.

(26) Spec. 34 (§ 178.19 of this subchapter). Polyethylene container without overpack, not over 30 gallons capacity.

(27) Spec. 33A (§ 178.150 of this subchapter). Polystyrene case (non-reusable container) with inside glass bottles not over 5-pint capacity each. Not more than four 5-pint bottles may be packed in one outside packaging.

(28) Cylinders as prescribed for any compressed gas, except acetylene. All cylinder valves must be protected by one of the methods described in § 173.301(g)(1), (2), or (3). See § 173.34 (e)(16).

(29) Specs. MC 303 or MC 304. Tank motor vehicle meeting § 178.343-2(c) of this subchapter. Spec. MC 303 must have tanks fabricated from 12-gauge, Type 316 stainless steel. MC 303 is authorized only for phosphoric acid and solutions thereof.

(30) Spec. MC 307 (§§ 178.340, 178.342 of this subchapter). Tank motor vehicle meeting § 178.343-2(c) of this subchapter.

(31) Specs. MC 306, MC 310, MC 311, or MC 312 (§§ 178.340, 178.341, 178.330, 178.331, 178.343 of this subchapter). Tank motor vehicles. If cargo tank is constructed with bottom outlets, they must meet § 178.343-5 of this subchapter. Spec. MC 306 must have tanks fabricated from 12-gauge, Type 316 stainless steel. MC 306 is authorized only for phosphoric acid and solutions thereof.

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(32) (Reserved)

(33) (Reserved)

(34) Spec. 42B (§ 178.107 of this subchapter). Aluminum drum.

(b) Except for a hazardous waste or a hazardous substance, a material classed as a corrosive material that is corrosive only to steel and does not meet the definition of any other hazard class defined in this subchapter, is excepted from the requirements of this subchapter for highway transportation when transported in a portable tank or cargo tank constructed of materials that will not react dangerously with or be degraded by the material being transported.

(Source: 7 Ill. Reg 3486, effective April 2, 1983)

§ 173.245a CORROSIVE LIQUIDS, N.O.S. SHIPPED IN BULK.

(a) Corrosive liquids, n.o.s. which are listed in the following table, may not be shipped in bulk unless they are packaged as follows:

Corrosive liquid	Authorized portable tank ³
Dichlorobutene and Dichlorobutene mixtures -----	not allowed
Ethyl chlorothiolformate -----	DOT-51 monel-clad.
Ethyl phosphonothioic dichloride, anhydrous -----	DOT-51.
Ethyl phosphonous dichloride, anhydrous -----	DOT-51.
Ethyl phosphorodichloridate -----	not allowed
Methyl phosphonothioic, dichloride, anhydrous -----	DOT-51.
Metnyl phosphonous dichloride ¹ -----	DOT-51.

1 In an unlined tank, must be loaded and shipped under a blanket of nonflammable, dry, inert gas, adequate to displace any significant amount of air.

2 (Reserved)

3 Tank must be equipped with a safety-relief valve set at not less than 100 psig. In addition, the relief valve must comply with § 173.315 (i) (1).

(b) Corrosive liquids, n.o.s., except those listed in paragraph (a) of this section, when shipped in bulk, must be packaged as prescribed by § 173.245.

§ 173.245b CORROSIVE SOLIDS NOT SPECIFICALLY PROVIDED FOR.

(a) Corrosive solids, as defined in § 173.240, other than those for which special requirements are prescribed, must be packaged in containers fully complying with § 173.24, as follows:

(1) Metal, wooden, or fiberboard box or case with inside containers which must be earthenware, glass, metal, plastic, or fiber or composition board of not more than 10 pounds net weight capacity each.

(2) Fiberboard box with inside paper bags, not over 50 pounds total net capacity.

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- (3) Fiberboard box with one inside plastic bag of not over 120 pounds net weight capacity.
- (4) Metal drum.
- (5) Fiber drum not exceeding 550 pounds net weight and not over 65-gallon capacity.
- (6) Plastic drum or pail not exceeding 90 pounds net weight and not over 7-gallon capacity.
- (7) Bag: Each bag filled to weight with product and closed as for shipment must be capable of withstanding four drops from a height of 4 feet onto a solid surface, one drop on each end and one drop on each face, without sifting or rupture. Authorized net weight not to exceed 110 pounds.
- (8) Metal portable tank or closed bin of not over 7,000 pounds gross weight.
- (9) Fiberglass or rubber tank or closed bin of not over 74-cubic-foot capacity.
- (10) Metal sift-proof cargo tank or hopper-type or pneumatic bulk vehicle.

§ 173.246 ANTIMONY PENTAFLUORIDE, BROMIDE PENTAFLUORIDE, IODINE PENTAFLUORIDE, BROMINE TRIFLUORIDE, AND CHLORINE TRIFLUORIDE.

(a) Antimony pentafluoride must be chemically anhydrous. Materials cited in the heading of this section must be packed in specification packagings as follows:

(1) Specs. 3A150, 3AA150, 3B240, 3BN150, 4B240, 4BA240, 4BW240, or 3E1800 (§§ 178.36, 178.37, 178.38, 178.39, 178.50, 178.51, 178.61, 178.42 of this subchapter). Cylinders. Each valve outlet must be sealed by a threaded cap or a threaded plug. Cylinder valves must be protected as specified for corrosive gases in § 173.301(g). No cylinder may be equipped with any safety relief device. Spec. 3E1800 cylinders must be packaged in accordance with the requirements of § 173.301(k).

(2) Specs. 106A500X or 110A500W (§§ 179.300, 179.301 of this subchapter). Tanks. Authorized for iodine pentafluoride and chlorine trifluoride only. Each tank must be equipped with a valve protection cover and with solid steel plugs in place of fusible plug safety devices. No tank may be equipped with any safety relief device.

§ 173.247 ACETYL BROMIDE, ACETYL CHLORIDE, ACETYL IODIDE, ANTIMONY PENTACHLORIDE, BENZOYL CHLORIDE, BORON TRIFLUORIDE-ACETIC ACID COMPLEX, CHROMYL CHLORIDE, DICHLOROACETYL CHLORIDE, DIPHENYLMETHYL BROMIDE SOLUTION, PYRO SULFURYL CHLORIDE, SILICON CHLORIDE, SULFUR CHLORIDE (MONO AND DI), SULFURYL CHLORIDE, THIONYL CHLORIDE, TIN TETRACHLORIDE (ANHYDROUS), TITANIUM TETRACHLORIDE, AND TRIMETHYL ACETIC CHLORIDE.

(a) Acetyl bromide, acetyl chloride, acetyl iodide, antimony pentachloride, benzoyl chloride, boron trifluoride-acetic acid complex, chromyl chloride, dichloroacetyl chloride, diphenylmethyl bromide solutions, pyro sulfuryl chloride, silicon chloride, sulfur chloride (mono and di), sulfuryl chloride, thionyl chloride, tin tetrachloride (anhydrous), titanium tetrachloride, and trimethyl acetic chloride must be packaged in specification packagings as follows:

(1) Specs. 15A, 15B, 15C, 16A, or 19A (§§ 178.168, 178.169, 178.170, 178.185, or 178.190 of this subchapter). Wooden boxes with glass or earthenware inside containers not over 1 gallon each, except that inside containers up to 3 gallons each are authorized when only one is packed in an outside container.

(2) Spec. 6D (§ 178.102 of this subchapter). Cylindrical steel overpack with inside specs. 2S or 2SL (§§ 178.35, 178.35a of this subchapter) polyethylene packaging. Polyethylene used must be Type III as set forth in Appendix B-Specification for Plastics to Part 178 of this subchapter. Authorized for acetyl chloride, dichloroacetyl chloride, sulfuryl chloride and trimethyl acetyl chloride only.

(3) Specs. 1A, 1D, 1K, or 1M (§§ 178.1, 178.4, 178.14, 178.17 of this subchapter). Glass carboys in boxes or expanded polystyrene packagings (not permitted for antimony pentachloride or tin tetrachloride, anhydrous).

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(1) Specs. 15A, 15B, 15C, 16A, or 19A (§§ 178.168, 178.169, 178.170, 178.185, 178.190 of this subchapter). Wooden boxes. Completed package, with glass packaging filled with water, must be capable of withstanding six four-foot drops onto solid concrete in the following order; bottom, four sides, and top, without breakage.

§ 173.352 SODIUM AND POTASSIUM CYANIDE SOLUTIONS AND CYANIDE SOLUTION, N.O.S..

(a) Sodium and potassium cyanide solutions, and cyanide solutions, n.o.s. must be packed in specification containers as follows:

(1) Specs. 5, 5A, or 5B (§§ 178.80, 178.81, or 178.82 of this subchapter). Metal barrels or drums without galvanizing inside, with openings not exceeding 2.3 inches in diameter.

(2) Specs. 17E or 37B (§§ 178.116, 178.132 of this subchapter). Metal drums (single-trip), with welded side seams, with openings not exceeding 2.3 inches in diameter.

(3) Specs. 15A, 15B, 15C, 16A, or 19A (§§ 178.168, 178.169, 178.170, 178.185 or 178.190 of this subchapter). Wooden boxes with inside glass or earthenware containers not over 1-gallon capacity each, or inside metal containers not over 10 gallons capacity each, and without galvanizing.

(4) (Reserved)

(5) Specs. MC 300, MC 301, MC 302, MC 303, MC 305, or MC 306 (§§ 178.321, 178.322, 178.323, 178.324, 178.326, 178.340, 178.341 of this chapter). Tank motor vehicles.

(Source: 7 Ill. Reg 3486, effective April 2, 1983)

§ 173.353 METHYL BROMIDE AND METHYL BROMIDE MIXTURES.

(a) Methyl bromide, liquid (bromomethane); methyl bromide and ethylene dibromide mixture liquid; or methyl bromide and more than 2 percent chloropicrin mixture, liquid; must be packed in specification containers as follows:

(1) Spec. 5A (§ 178.81 of this subchapter). Metal drums not exceeding 30 gallons capacity or metal drums of bilge type not exceeding 33 gallons capacity and with openings not exceeding 2.3 inches in diameter. Not authorized for mixtures containing any compressed gas.

(2) Specs. 15A, 15B, 15C, 16A, 19A, or 12B (§§ 178.168, 178.169, 178.170, 178.185, 178.190, 178.205 of this subchapter). Wooden, wire-bound wooden, or fiberboard boxes, with inside metal cans containing not over 1-pound each, or inside metal cans with a minimum wall thickness of 0.007-inch containing not over 1-3/4 pound each. The 1-pound can must be able to withstand an interior pressure of 130 psig without leakage or permanent distortion and pressure of contents must not exceed 130 psig at 130° F. (55° C.). The 1-3/4 pound can must be able to withstand an interior pressure of 140 psig without leakage or permanent distortion and pressure of contents must not exceed 140 psig at 130° F. (55° C). Outage shall be such that the cans will not become liquid full at 130° F. Cans must be of tinplate or lined with suitable material and must have concave or pressure ends.

(3) Specs. 3A225, 3AA225, 3B225, 3E1800, 4A225, 4B225, 4BA225, or 4BW225 (§§ 178.36, 178.37, 178.38, 178.42, 178.49, 178.50, 178.51, 178.61 of this subchapter). Metal cylinders. Valves and other closing devices must be protected to prevent damage in transit, by screw-on metal caps or by packing the cylinders in strong boxes or crates. Cylinders having a wall thickness of less than 0.08-inch must be packed in boxes or crates (see § 173.25).

(4) Specs. 4D300 or 4DA500 (§§ 178.53 or 178.58 of this subchapter). Metal spheres, must be packed in strong boxes or crates (see § 173.25).

(5) (Reserved).

(6) Spec. 106A500X (§§ 179.300, 179.301 of this subchapter) tanks. Outage must be sufficient to prevent tanks from becoming liquid full at 130° F. (55° C.). (See § 177.834(m) of this subchapter for special requirements for highway shipments.)

(7) Spec. 12B (§ 178.205 of this subchapter). Fiberboard box with inside tinplated metal cans containing not more than 6 ounces net weight of product per can. Cans must be capable of withstanding a pressure of 75 pounds per square inch at 130° F. without leakage or permanent distortion. Not more than 12 cans may be packed snugly in the outside fiberboard box and gross

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weight of completed package shall not exceed 30 pounds. Authorized only for methyl bromide and ethylene dibromide mixtures.

(b) (Reserved).

(c) Outage must be sufficient to prevent cylinders or spheres from becoming entirely filled with liquid at 130° F. (55° C.) and when the vacant space (outage) is charged with a nonflammable nonliquefied compressed gas, the pressure in the cylinder or sphere at 130° F. (55° C.) must not exceed 5/4 the marked service pressure of the cylinder or sphere.

(d) Spec. 17C (§ 178.115 of this subchapter). Metal drums (single-trip) not over 5-1/4 gallons marked capacity each and having no opening exceeding 2.3 inches in diameter. Authorized only for mixtures of methyl bromide and ethylene dibromide, liquid containing not over 40 percent by weight of methyl bromide.

(e) Specs. MC 330 and MC 331 (§§ 178.336, 178.337 of this subchapter). Tank motor vehicle having a design pressure not less than 250 pounds per square inch equipped with an approved spring-relief safety valve. Outage must be sufficient to prevent tank from becoming entirely filled with liquid at 130° F.

§ 173.353a METHYL BROMIDE, LIQUID, AND NONFLAMMABLE, NONLIQUEFIED COMPRESSED GAS MIXTURES.

(a) Methyl bromide, liquid and nonflammable, nonliquefied compressed gas mixtures must be packed in specification containers as noted in § 173.353(a)(2), (3), (4), (5), (6), and (c).

(b) Liquid may contain 2 percent or less by weight chloropicrin.

§ 173.354 MOTOR FUEL ANTIKNOCK COMPOUND OR TETRAETHYL LEAD.

(a) Motor fuel antiknock compound (a mixture of one or more organic lead compounds such as tetraethyl lead, triethylmethyl lead, diethyldimethyl lead, ethyltrimethyl lead, and tetramethyl lead, with one or more halogen compounds such as ethylene dibromide and ethylene dichloride, hydrocarbon solvents or other equally efficient stabilizers) or tetraethyl lead must be packed in specification containers as follows:

(1) Spec. 15A (§ 178.168 of this subchapter). Wooden boxes with inside glass or earthenware containers of not over 1-pint capacity each, or metal cans, inclosed in hermetically sealed (soldered) metal cans, spec. 2A (§ 178.20 of this subchapter).

(2) Specs. 5 or 5A (§§ 178.80 or 178.81 of this subchapter). Metal barrels or drums, with openings not exceeding 2.3 inches in diameter.

(3) Cylinders as prescribed for any compressed gas, except acetylene.

(4) (Reserved)

(5) Specs. MC 330 or MC 331 (§§ 178.336, 178.337 of this subchapter) (see Note 1). Tank motor vehicles. Authorized for motor fuel antiknock compound only.

NOTE 1: Specs. MC 300, MC 301,¹ MC 302 or MC 303 (§§ 178.321, 178.322, 178.323, or 178.324 of this chapter) tank motor vehicles in motor fuel antiknock compound service prior to October 1, 1955 may be continued in service.

(6) Spec. 51 (§ 178.245 of this subchapter). Portable tanks having a minimum design pressure of 100 pounds per square inch. Authorized for motor fuel antiknock compound only.

(7) Spec. 12B (§ 178.205 of this subchapter). Fiberboard boxes constructed on at least 375 pound test (Mullen or Cady) solid fiberboard with inside metal cans enclosed in hermetically sealed (soldered) metal cans, not over 5 pounds capacity each. Each inside metal container must be enclosed in a taped, double-faced corrugated liner constructed of at least 200 pound test (Mullen or Cady) fiberboard and fitted with die-cut end caps constructed of at least 200 pound test (Mullen or Cady) double-walled corrugated fiberboard. Authorized gross weight not over 90 pounds.

¹ Use of existing cargo tanks authorized, but new construction not authorized.

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(1) As prescribed in § 173.346.

(2) Specs. 6A, 6B, or 6C (§§ 178.97, 178.98, or 178.99 of this subchapter). Metal barrels or drums. Authorized only for viscous mixtures or those which may become partially solid.

(3) Specs. 17C or 17H (§§ 178.115 or 178.118 of this subchapter). Metal drums (single-trip). Drums with opening exceeding 2.3 inches in diameter authorized only for viscous mixtures or those which may become partially solid.

§ 173.362 4-CHLORO-O-TOLUIDINE HYDROCHLORIDE.

(a) 4-Chloro-o-toluidine hydrochloride must be shipped in specification containers as follows:

(1) Spec. 12B (§ 178.205 of this subchapter). Fiberboard boxes with glass, polyethylene, or equally efficient inside containers not over 1-quart capacity each, securely packed in a tightly closed metal container.

(2) Specs. 15A or 15B (§§ 178.168 or 178.169 of this subchapter). Wooden boxes with glass, polyethylene, or equally efficient inside containers not over 1-quart capacity each. Glass containers must be securely packed in tightly closed metal containers.

(3) Specs. 17C or 17H (§§ 178.115 or 178.118 of this subchapter). Metal drums (single-trip).

(4) Specs. 6A, 6B, or 6C (§§ 178.97, 178.98, or 178.99 of this subchapter). Metal barrels or drums.

§ 173.362a DINITROPHENOL SOLUTIONS.

(a) Dinitrophenol solutions must be packed in specification containers as follows:

(1) In containers prescribed in § 173.346.

(2) Spec. 12B (§ 178.205 of this subchapter). Fiberboard box with glass, earthenware, or metal inside containers not over 1-gallon capacity each; not to contain more than 4 inside glass or earthenware containers if their capacity is greater than 5 pints each.

§ 173.363 GENERAL PACKAGING REQUIREMENTS FOR POISON B SOLIDS.

(a) Closing and cushioning. All containers must be tightly and securely closed. Inside containers must be cushioned as prescribed, or in any case when necessary to prevent breakage or leakage.

(b) Testing inside containers. All inside containers, except those made of glass, must be able to pass a test by dropping, after filling, from a height of 4 feet to solid concrete without rupture or sifting of contents, except that for bags with contents weighing 25 pounds, a drop test of 2 feet is required.

§ 173.364 LIMITED QUANTITIES OF POISON B SOLIDS.

(a) Unless otherwise excluded by paragraph (3) of this section, limited quantities of Poison B solids for which exceptions are permitted as noted by reference to this section in § 172.101 of this subchapter are excepted from specification packaging requirements of this Part if in tightly closed, inside packaging securely cushioned when necessary to prevent breakage according to the following paragraphs.

(1) In inside glass, earthenware, or composition bottles or jars, or metal packaging, or lock-corner sliding-lid wooden boxes, not over 5 pounds capacity each; or inside chipboard, pasteboard, or fiber cartons, cans, boxes, or tightly closed strong plastic bags or bottles compatible with product, not over 1-pound capacity each, packed in an outside wooden or fiberboard box, or wooden barrel or keg, or molded expanded polystyrene case. Net weight of contents of each outside container may not exceed 100 pounds.

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(2) In inside plastic bottles or jars, chipboard, pasteboard or fiber cartons, cans, or boxes, of not over 5 pounds capacity each, packed in outside fiberboard or wooden boxes. Not more than 6 of these cartons shall be packed in any outside container.

(3) The following materials are excluded from this exception: Cyanides (other than as specified in § 173.370(b) and (d), hexaethyl tetraphosphate mixtures, methyl parathion mixtures, organic phosphorus compound mixtures, and organic phosphate mixtures.

(b) Special exceptions for shipment of certain drugs and medicines in the ORM-D class are prescribed in Subpart N of this part.

(Source: 7 Ill. Reg 3486, effective April 2, 1983)

§ 173.365 POISON B SOLIDS NOT SPECIFICALLY PROVIDED FOR.

(a) Poison B solids, as defined in § 173.343, other than those for which special requirements are prescribed, must be packaged as follows:

(1) Specs. 5, 5A, 5B, 6A, 6B, or 6C (§§ 178.80, 178.81, 178.82, 178.97, 178.98, or 178.99 of this subchapter). Metal barrels or drums.

(2) Specs. 17E, 17H, 37A, or 37B (§§ 178.116, 178.118, 178.131, 178.132 of this subchapter). Metal drums (single-trip). Gross weight may not exceed 460 pounds. Regardless of the gross weight marking embossed on the drum, a drum constructed of 22-gauge steel is authorized for material fused solid in the drum with a gross weight not to exceed 880 pounds and for waste material containing arsenic trioxide with a gross weight not to exceed 550 pounds.

(3) (Reserved)

(4) (Reserved)

(5) Spec. 12B (§ 178.205 of this subchapter). Fiberboard boxes, with inside wide-mouth, high-density polyethylene jars of 2-1/2 pound capacity with a minimum wall thickness of 0.020-inch, or of 3-pound capacity with a minimum wall thickness of 0.035-inch. Each jar must have a screw-cap closure and not more than six jars are authorized per box. Completed package must meet test requirements of § 178.210-10 of this subchapter.

(6) Specs. 12B or 12C (§§ 178.205 or 178.206 of this subchapter). Fiberboard boxes, with inside containers which must be metal cans not over 25 pounds capacity each; glass bottles not over 1-gallon capacity each; fiber cans or boxes, spec. 2G (§ 178.26 of this subchapter); sliding-top wooden boxes, lined to prevent sifting, not over 25 pounds capacity each; or paper bags, spec. 2D (§ 178.23 of this subchapter). Packages containing glass or earthenware containers must not weigh over 65 pounds gross nor contain more than 4 inside containers of over 5 pints capacity each. Outside containers must be not over 5,000 cubic inches capacity nor contain over 50 pounds net weight each, except as provided in § 178.205-23 of this subchapter.

Test: The completed package prepared as for shipping must be capable of standing a drop of 4 feet to solid concrete without breakage of the container or any sifting of contents.

(7) Spec. 12B (§ 178.205 of this subchapter). Fiberboard boxes with securely closed inside fiberboard or chipboard boxes not over 6 pounds net weight each. Interior containers must be at least .023-inch thick for those not over 2-1/2 pounds net weight each and at least .034-inch thick for others. Outside packages must contain not over 36 pounds net weight of material each.

Test: The individual interior containers as well as the completed package prepared as for shipping must be capable of standing a drop of 4 feet to solid concrete without breakage of the container or any sifting of contents.

(8) Spec. 15A (§ 178.168 of this subchapter). Wooden boxes, with inside containers which must be securely closed paper bags, placed within a waterproof duplex bag, spec. 2J (§ 178.28 of this subchapter). Net weight of material in one outside box, not over 100 pounds.

(9) Specs. 15A, 15B, 15C, 16A, or 19A (§§ 178.168, 178.169, 178.170, 178.185, or 178.190 of this subchapter). Wooden boxes, with inside containers which must be metal cans not over 25 pounds capacity each; glass or earthenware containers not over 1-gallon capacity each; except

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(iv) Penetration (required for packages exceeding 15 pounds gross weight only)--a freedrop of the package through a distance of 40 inches, striking the top end of a vertical cylindrical mild steel solid bar on an essentially unyielding surface, in a position for which maximum damage is expected. The bar must be 1.5 inches in diameter. The top of the bar must be horizontal, with its edge rounded to a radius not exceeding one-quarter inch. The bar must be of such length as to cause maximum damage to the package, but not less than 8 inches long. The long axis of the bar must be vertical to the unyielding horizontal impact surface of the package.

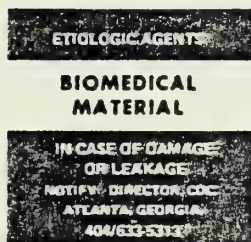
(3) TESTING PROCEDURE. (i) At least one sample of each type package (maximum size and gross weight), filled with water, must be subjected to the water spray test unless exempted by subparagraph (2)(i) of this paragraph.

(ii) This sample package then must be given the freedrop and one of the penetration tests, as applicable. Separate wetted sample packages may be used for the freedrop and the penetration test.

(iii) If the sample package is exempted from the water spray test by subparagraph (2)(i) of this paragraph, at least one sample of each type package (maximum size and gross weight), filled with water, must be subjected consecutively to the freedrop and the penetration test.

§ 173.388 LABELING OF PACKAGES CONTAINING ETIOLOGIC AGENTS.

(a) Each package containing an etiologic agent, except a diagnostic specimen or a biological product, must be labeled as prescribed by the regulations of the U.S. Department of Health, Education, and Welfare, 42 CFR 72.25(c)(4). For information, this label is required to be a rectangle measuring 51 mm. (2 inches) high and 102.5 mm. (4 inches) long, predominantly red printing on a white background, and appears as follows:



§ 173.389 RADIOACTIVE MATERIALS; DEFINITIONS.

For the purpose of this subchapter:

(a) "Fissile radioactive material" means the following material: Plutonium-238, plutonium-239, plutonium-241, uranium-233, or uranium-235, or any material containing any of the foregoing materials. See § 173.396(a) for exclusions. Fissile radioactive material packages are classified according to the controls needed to provide nuclear criticality safety during transportation as follows:

(1) FISSILE CLASS I. Packages which may be transported in unlimited numbers and in any arrangement, and which require no nuclear criticality safety controls during transportation. For purposes of nuclear criticality safety control, a transport index is not assigned to Fissile Class I packages. However, the external radiation levels may require a transport index number.

(2) FISSILE CLASS II. Packages which may be transported together in any arrangement but in numbers which do not exceed an aggregate transport index of 50. For purposes of nuclear criticality safety control, individual packages may have a transport index of not less than 0.1 and not more than 10. However, the external radiation levels may require a higher transport index number but not to exceed 10. Such shipments require no nuclear criticality safety control by the shipper during transportation.

(3) FISSILE CLASS III. Shipments of packages which do not meet the requirements of Fissile Class I or Class II and which are controlled to provide nuclear criticality safety in transportation by special arrangements between the shipper and the carrier.

NOTE 1: Uranium-235 exists only in combination with various percentages of uranium-234 and uranium-238. "Fissile radioactive material" as applied to uranium-235 refers to the amount of uranium-235 actually contained in the total quantity of uranium being transported.

NOTE 2: Radioactive material may consist of mixtures of fissile and non-fissile radionuclides. "Fissile radioactive material" refers to the amount of plutonium-238, plutonium-239, plutonium-241, uranium-233, uranium-235, or any combination thereof actually contained in the mixture. The "radioactivity" of the mixture consists of the total activity of both the fissile and nonfissile radionuclides. All mixtures containing "fissile material" shall be subject to § 173.396.

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(b) "Large quantity radioactive materials" means a quantity the aggregate radioactivity of which exceeds that specified as follows:

- (1) Groups I or II (see paragraph (h) of this section) radionuclides: 20 curies.
- (2) Groups III or IV radionuclides: 200 curies.
- (3) Group V radionuclides: 5,000 curies.
- (4) Groups VI or VII radionuclides: 50,000 curies.
- (5) Special form material: 5,000 curies.

(c) "Low specific activity material" means any of the following:

- (1) Uranium or thorium ores and physical or chemical concentrates of those ores;
- (2) Unirradiated natural or depleted uranium or unirradiated natural thorium;
- (3) Tritium oxide in aqueous solutions provided the concentration does not exceed 5 millicuries per milliliter;
- (4) Material in which the activity is essentially uniformly distributed and in which the estimated average concentration per gram of contents does not exceed:
 - (i) 0.0001 millicuries of Group I (see § 173.389(h)) radionuclides; or
 - (ii) 0.005 millicuries of Group II radionuclides; or
 - (iii) 0.3 millicuries of Groups III or IV radionuclides.

NOTE: This includes but is not limited to materials of low radioactivity concentration such as residues or solutions from chemical processing; wastes such as building rubble, metal, wood, and fabric scrap, glassware, paper and cardboard; solid or liquid plant waste, sludges, and ashes.

(5) Objects of nonradioactive material externally contaminated with radioactive material, provided that the radioactive material is not readily dispersible and the surface contamination when averaged over an area of 1 square meter, does not exceed 0.0001 millicurie (220,000 disintegrations per minute) per square centimeter of Group I radionuclides or 0.001 millicurie (2,200,000 disintegrations per minute) per square centimeter of other radionuclides.

(d) "Normal form radioactive materials" means those which are not special form radioactive materials. Normal form radioactive materials are grouped into transport groups (see paragraph (h) of this section).

(e) "Radioactive material" means any material or combination of materials, which spontaneously emits ionizing radiation. Materials in which the estimated specific activity is not greater than 0.002 microcuries per gram of material, and in which the radioactivity is essentially uniformly distributed, is not classed as a Radioactive material under this subchapter.

(f) "Removable radioactive contamination" means radioactive contamination which can be readily removed in measurable quantities by wiping the contaminated surface with an absorbent material. The measurable quantities shall be considered as being not significant if they do not exceed the limits specified in § 173.397.

(g) "Special form radioactive materials" means those which, if released from a package, might present some direct radiation hazard but would present little hazard due to radiotoxicity and little possibility of contamination. This may be the result of inherent properties of the material (such as metals or alloys), or acquired characteristics, as through encapsulation. The criteria for determining whether a material meets the definition of special form are prescribed in § 173.398(a).

(h) "Transport group" means any one of seven groups into which normal form radionuclides are classified according to their radiotoxicity and their relative potential hazard in transportation, and as listed in § 173.390.

(i) "Transport index" means the number placed on a package to designate the degree of control to be exercised by the carrier during transportation. The transport index to be assigned to a package of radioactive materials shall be determined by either subparagraph (1) or (2) of this paragraph, whichever is larger. The number expressing the transport index shall be rounded up to the next highest tenth; e.g., 1.01 becomes 1.1.

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(1) The highest radiation dose rate, in millirem per hour at three feet from any accessible external surface of the package; or

(2) For Fissile Class II packages only the transport index number calculated by dividing the number "50" by the number of similar packages which may be transported together (see § 173.396), as determined by the procedures prescribed in the regulations of the U.S. Nuclear Regulatory Commission, Title 10, Code of Federal Regulations, Part 71.

(j) "Type A packaging" means packaging which is designed in accordance with the general packaging requirements of §§ 173.24 and 173.393, and which is adequate to prevent the loss or dispersal of the radioactive contents and to retain the efficiency of its radiation shielding properties if the package is subject to the tests prescribed in § 173.398(b).

(k) "Type B packaging" means packaging which meets the standards for Type A packaging, and, in addition, meets the standards for hypothetical accident conditions of transportation as prescribed in § 173.398(c).

(l) "Type A quantity" and "Type B quantity" radioactive materials means a quantity the aggregate radioactivity of which does not exceed that specified as follows:

Transport group (see § 173.389(h))	Type A quantity (in curies)	Type B quantity (in curies)
I -----	0.001	20
II -----	0.05	20
III -----	3	200
IV -----	20	200
V -----	20	5,000
VI and VII -----	1,000	50,000
Special form -----	20 ¹	5,000

1 Except that for Californium-252 the Type A quantity limit for special form is 2 curies.

(m) CONTAINMENT SYSTEM. Containment system of a radioactive materials package means those components of the packaging including special form encapsulation were used, which have been specified by the package designer as intended to retain the radioactive contents during transport, whether or not individual vessels in the packaging retain their integrity of containment.

(n) MAXIMUM NORMAL OPERATING PRESSURE. Maximum normal operating pressure means the maximum pressure above atmospheric pressure at mean sea level that would develop in the containment system in a period of 1 year, under the conditions of temperature and solar radiation corresponding to environmental conditions of transport in the absence of venting, external cooling by an ancillary system or operational controls during transport.

(o) "Exclusive Use" (also referred to as "sole use" or "Full Load" as used in IAEA regulations) means any shipment:

(1) From a single consignor having the exclusive use of a transport vehicle; and

(2) For which all initial, intermediate, and final loading and unloading is carried out by or under the direction of the consignor, consignee, or his designated agent.

(p) "Radioactive Device" means any manufactured article such as an instrument, clock, electronic tube or apparatus, or similar device having radioactive material (other than liquid) in a nondispersible form as a component part.

(q) "Closed transport vehicle" means a vehicle equipped with a securely attached exterior enclosure, which during normal transport, restricts the access of unauthorized persons to the cargo space containing the radioactive materials. The enclosure may be either temporary or permanent, may be of the "see-through" type, and must limit access from top, sides, and ends.

(Source: 7 Ill. Reg 3486, effective April 2, 1983)

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ILLINOIS HAZARDOUS MATERIALS TRANSPORTATION REGULATIONS

§ 173.390 TRANSPORT GROUPS OF RADIONUCLIDES.

(a) List of radionuclides:

Element ¹	Radionuclide ³	Transport group						
		I	II	III	IV	V	VI	VII
Actinium(89)-----	Ac-227-----	X						
	Ac-228-----	X						
Americium(95)-----	Am-241-----	X						
	Am-243-----	X						
Antimony(51)-----	Sb-122-----				X			
	Sb-124-----			X				
	Sb-125-----			X				
Argon(18)-----	Ar-37-----						X	
	Ar-41-----		X					
	Ar-41(uncompressed) ² ---					X		
Arsenic(33)-----	As-73-----				X			
	As-74-----				X			
	As-76-----				X			
	As-77-----				X			
Astatine(85)-----	At-211-----			X				
Barium(56)-----	Ba-131-----				X			
	Ba-133-----		X					
	Ba-140-----			X				
Berkelium(97)-----	Bk-249-----	X						
Beryllium(4)-----	Be-7-----				X			
Bismuth(83)-----	Bi-206-----				X			
	Bi-207-----			X				
	Bi-210-----		X					
	Bi-212-----			X				
Bromine(35)-----	Br-82-----				X			
Cadmium(48)-----	Cd-109-----				X			
	Cd-115m-----			X				
	Cd-115-----				X			
Calcium(20)-----	Ca-45-----				X			
	Ca-47-----				X			
Californium(98)-----	Cf-249-----	X						
	Cf-250-----	X						
	Cf-252-----	X						
Carbon(6)-----	C-14-----				X			

See footnotes at end of table.

ILLINOIS HAZARDOUS MATERIALS TRANSPORTATION REGULATIONS

SUBPART J-OTHER REGULATED MATERIAL; DEFINITION AND PREPARATION

§ 173.500 DEFINITIONS.

(a) An Other Regulated Material (ORM) is a material that-

(1) May pose an unreasonable risk to health and safety or property when transported in commerce; and

(2) Does not meet any of the definitions of the other hazard classes specified in this subchapter, or

(3) Has been reclassified an ORM (specifically or permissively) according to this subchapter.

(b) ORM's are divided into classes as follows:

(1) An ORM-A material is a material which has an anesthetic, irritating, noxious, toxic, or other similar property and which can cause extreme annoyance or discomfort to passengers and crew in the event of leakage during transportation.

(2) An ORM-B material is a material (including a solid when wet with water) capable of causing significant damage to a transport vehicle or vessel from leakage during transportation. Materials meeting one or both of the following criteria are ORM-B materials;

(i) A liquid substance that has a corrosion rate exceeding 0.250 inch per year (IPY) on aluminum (nonclad 7075-T6) at a test temperature of 130° F. An acceptable test is described in NACE Standard TM-01-69.

(ii) Specifically designated by name in § 172.101 of this subchapter.

(3) An ORM-C material is a material which has other inherent characteristics not described as an ORM-A or ORM-B but which make it unsuitable for shipment, unless properly identified and prepared for transportation. Each ORM-C material is specifically named in § 172.101 of this subchapter.

(4) An ORM-D material is a material such as a consumer commodity which, though otherwise subject to the regulations of this subchapter, presents a limited hazard during transportation due to its form, quantity and packaging. They must be materials for which exceptions are provided in § 172.101 of this subchapter. A shipping description applicable to each ORM-D material or category of ORM-D materials is found in § 172.101 of this subchapter.

(5) An ORM-E is a material that is not included in any other hazard class, but is subject to the requirements of this subchapter. Materials in this class include:

(i) Hazardous waste.

(ii) Hazardous substances as defined in § 171.8 of this subchapter.

(Source: 7 Ill. Reg 3436, effective April 2, 1983)

§ 173.505 (RESERVED)

§ 173.510 GENERAL PACKAGING REQUIREMENTS.

(a) ORM-E materials must be prepared for shipment in compliance with the following:

(1) Each material must be offered for transportation and transported in compliance with Subparts B, C, and D of Part 172 of this subchapter and Subparts A and B of Part 173.

(2) For packagings of 110 gallon capacity or less, sufficient outage (ullage) must be provided so the packaging will not be liquid full at 130°F. (55°C.).

(3) When a liquid or solid has an absolute vapor pressure exceeding 16 p.s.i. at 100° F. (38°C.). The primary packaging must be capable of withstanding the inside vapor pressure at 130°F. without leakage.

(4) Any material classed as an ORM-E material, which may cause a hazard in transportation due to its reaction with water, must be packaged with either an inner or outer water proof packaging.

(5) Portable tanks, tank cars, cargo tanks, hopper and dump type transport vehicles must be free from leaks and all discharge openings must be securely closed during transportation.

(Source: 7 Ill. Reg 3486, effective April 2, 1983)

SUBPART K-(RESERVED)

SUBPART L-(RESERVED)

SUBPART M-(RESERVED)

ILLINOIS HAZARDOUS MATERIALS TRANSPORTATION REGULATIONS

SUBPART N-OTHER REGULATED MATERIAL; ORM-D

§ 173.1200 CONSUMER COMMODITY.

(a) In order to be transported under the proper shipping name of "Consumer commodity," a material must meet that definition. It may be reclassified and offered for shipment as ORM-D material (see § 173.500) provided that an ORM-D exception is authorized in specific sections applicable to the material, and that it is prepared in accordance with the following paragraphs. (The gross weight of each package must not exceed 65 pounds.)

(1) FLAMMABLE LIQUIDS MUST BE: (i) In inside metal containers, each having a rated capacity of 1 quart or less, packed in strong outside packagings;

(ii) In inside containers, each having a rated capacity of 1 pint or less, packed in strong outside packagings.

(iii) In inside containers, each having a rated capacity of one gallon or less, packed in strong outside packagings. The provisions of this exception apply only if the flash point of the material is 73° F. or higher.

(2) CORROSIVE LIQUIDS MUST BE: (i) In bottles, each having a rated capacity of 1 pint or less, each enclosed in a metal can, packed in strong outside packagings.

(ii) In metal or plastic containers, each having a rated capacity of 1 pint or less, packed in strong outside packagings.

(iii) In metal or plastic inside containers, each having a rated capacity of not over 1 quart, packed in strong outside packaging provided the liquid mixture contains 15 percent or less corrosive material and the remainder of the mixture does not meet the definition of a hazardous material as defined in this subchapter.

(3) CORROSIVE SOLIDS MUST BE: (i) In earthenware, glass, plastic or paper containers each having a net weight of 5 pounds or less, packed in strong metal, wooden, or fiberboard outside packagings, each having a net weight of 25 pounds or less.

(ii) In metal, rigid fiber, or composition cans or cartons or rigid plastic containers each having a net weight of 10 pounds or less, packed in strong outside packagings each having a net weight of 25 pounds or less.

(iii) In metal, rigid fiber, or composition cans or cartons or rigid plastic containers, each having a rated capacity of not over 20 pounds, overpacked in metal, wooden or fiberboard outside containers not exceeding 50 pounds net weight provided the solid mixture contains 10 percent or less corrosive material and the remainder of the mixture does not meet the definition of a hazardous material as defined in this subchapter.

(4) FLAMMABLE SOLIDS except for charcoal briquettes must be inside containers each having a net weight of 1 pound or less, packed in strong outside packagings each having a net weight of 25 pounds or less. Charcoal briquettes may be shipped in packagings having a net weight of 65 pounds or less.

(5) OXIDIZERS must be in inside containers each having a rated capacity of 1 pint or less for liquids or a net weight of 1 pound or less for solids, packed in strong outside packaging each having a net weight of 25 pounds or less.

(6) ORGANIC PEROXIDES MUST BE: (i) In inside containers which must be securely packed and cushioned with noncombustible cushioning material in strong outside packagings containing not over 1 pint or 1 pound net quantity of the materials. Cushioning is not required when the liquid is contained in strong, securely closed, plastic packagings, not over 1 ounce capacity each, properly packed to prevent leakage or breakage.

(ii) In strong outside packagings of 24 or less inside fiberboard containers, each having 70 or less securely closed tubes having a maximum fluid capacity of 1/6-ounce each and securely packed in noncombustible cushioning material. Each fiberboard container may not contain more than 1 pint of liquid.

(7) POISON B LIQUIDS OR SOLIDS must be in inside containers, each having a rated capacity of 8 ounces or less by volume for liquids or of 8 ounces or less net weight for solids packed in strong outside packagings.

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(8) COMPRESSED GASES MUST BE: (i) In inside containers, each having a water capacity of 4 fluid ounces or less (7.22 cubic inches or less), packed in strong outside packagings.

(ii) In inside metal container charged with a solution of materials and compressed gas or gases which is nonpoisonous, meeting all of the following:

(A) Capacity may not exceed 50 cubic inches (27.7 fluid ounces);

(B) Pressure in the container may not exceed 180 p.s.i.g. at 130° F. (55° C.). If the pressure exceeds 140 p.s.i.g. at 130° F., (55° C.) but does not exceed 160 p.s.i.g. at 130° F., (55° C.) a spec. DOT 2P (§ 178.33 of this subchapter) inside metal container must be used; if the pressure exceeds 160 p.s.i.g. at 130° F., (55° C.), a spec. DOT 2Q (§ 178.33a of this subchapter) inside metal container must be used. In any event the metal container must be capable of withstanding, without bursting, a pressure of one and one-half times the equilibrium pressure of the contents at 130° F. (55° C.);

(C) Liquid content of the material and gas may not completely fill the container at 130° F. (55° C.);

(D) The containers must be packed in strong outside packagings; and

(E) Each completed container filled for shipment must have been heated until the pressure in the container is equivalent to the equilibrium pressure of the content at 130° F. (55° C.) without evidence of leakage, distortion, or other defect.

(iii) In a non-refillable inside metal container of 50 cubic-inch capacity or less (27.7 fluid ounces), with foodstuffs or soaps and with soluble or emulsified compressed gas, provided the pressure in the container does not exceed 140 p.s.i.g. at 130° F. (55° C.). The metal container must be capable of withstanding, without bursting, a pressure of one and one-half times the equilibrium pressure of the contents at 130° F. (55° C.) and must comply with the following provisions:

(A) Containers must be packed in strong outside packagings, and

(B) Liquid content of the material and gas may not completely fill the container at 130° F. (55° C.).

(iv) In refillable inside metal containers with cream and soluble or emulsified compressed gas packed in strong outside packagings. Containers must be of such design that they will hold pressure without permanent deformation up to 375 p.s.i.g. and must be equipped with a device designed so as to release pressure without bursting of the container or dangerous projection of its parts at higher pressures.

(v) In non-refillable inside metal containers charged with a solution, containing biological products or a medical preparation which could be deteriorated by heat, and compressed gas or gases which is nonpoisonous and nonflammable. The capacity of each container may not exceed 35 cubic inches (19.3 fluid ounces). The pressure in the container may not exceed 140 p.s.i.g. at 130° F. (55° C.), and the liquid content of the product and gas may not completely fill the container at 130° F. (55° C.). One completed container out of each lot of 500 or less, filled for shipment, must be heated, until the pressure in the container is equivalent to the equilibrium pressure of the content at 130° F. (55° C.). There may not be evidence of leakage, distortion, or other defect. Container must be packed in strong outside packagings.

(vi) In electronic tubes, each having a volume of not more than 30 cubic inches and charged with gas to a pressure of not more than 35 p.s.i.g. and packed in strong outside packagings.

(vii) In an inside metal container as a component of an audible fire alarm system powered by a compressed gas meeting the following provisions:

(A) Each inside container must have contents which are not flammable, poisonous, or corrosive as defined under this Part;

(B) Each inside container may not have a capacity exceeding 35 cubic inches (19.3 fluid ounces);

(C) Each inside container may not have a pressure exceeding 70 p.s.i.g. at 70° F. (21° C.) and the liquid portion of the gas may not completely fill the inside container at 130° F. (55° C.);

(D) Each inside container must be designed and fabricated with a burst pressure of not less than five times its charged pressure or more at 130° F. (55° C.); and

(E) Each fire alarm system must be packed in a strong outside packaging.

ILLINOIS HAZARDOUS MATERIALS TRANSPORTATION REGULATIONS

SUBPART D - OTHER REGULATED MATERIAL; ORM-E

§ 173.1300 HAZARDOUS WASTE, LIQUID OR SOLID, N.O.S.; HAZARDOUS SUBSTANCE, LIQUID OR SOLID, N.O.S.

Hazardous waste, liquid or solid, n.o.s., or Hazardous substance, liquid or solid, n.o.s., may not be offered for transportation unless packaged in accordance with § 173.510.

(Source: 7 Ill. Reg 3486, effective April 2, 1983)

APPENDIX A-METHOD OF TESTING CORROSION TO SKIN

1. Corrosion to the skin is measured by patch-test technique on the intact skin of the albino rabbit, clipped free of hair. A minimum of six subjects are to be used in this test.
2. Introduce under a square cloth patch, such as surgical gauze measuring not less than 1 inch by 1 inch and two single layers thick, 0.5 milliliter (in the case of liquids) or 0.5 gram (in the case of solids and semisolids) of the substance to be tested.
3. Immobilize the animals with patches secured in place by adhesive tape.
4. Wrap the entire trunk of each animal with an impervious material, such as rubberized cloth, for the 4 hour period of exposure. This material is to aid in maintaining the test patches in position and retards the evaporation of volatile substances. It is not applied for the purpose of occlusion.
5. After 4 hours of exposure, the patches are to be removed and the resulting reactions are to be evaluated for corrosion.
6. Following this initial reading, all test sites are washed with an appropriate solvent to prevent further exposure.
7. Readings are again to be made at least at the end of a total of 48 hours (44 hours after the first reading).
8. Corrosion will be considered to have resulted if the substance in contact with the rabbit skin has caused destruction or irreversible alteration of the tissue. Tissue destruction is considered to have occurred if, at any of the readings, there is ulceration or necrosis. Tissue destruction does not include merely sloughing of the epidermis, or erythema, edema, or fissuring.

PART 174 (RESERVED)

PART 175 (RESERVED)

PART 176 (RESERVED)

(6) Spec. 12B (§ 178.205 of this chapter). Fiberboard boxes with inside containers which must be metal cans; sliding-lid wooden boxes; fiber cans or boxes, spec. 2G (§ 178.26 of this chapter), not over 5 pounds capacity each; or glass bottles not over 1 pound capacity each. Packages containing glass containers must not weigh over 65 pounds gross.

(7) Spec. 15A or 15B (§§ 178.168 or 178.169 of this subchapter). Wooden boxes lined, spec. 2F or 2M (§§ 178.25 or 178.31 of this subchapter).

(8) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 178.168, 178.169, 178.170, 178.185, or 178.190 of this subchapter). Wooden boxes with inside containers.

(9) Spec. 21C (§ 178.224 of this subchapter). Fiber drums. Authorized net weight not over 225 pounds.

(10) Spec. 22A (§ 178.196 of this subchapter). Plywood drums.

(11) Spec. 22B (§ 178.197 of this subchapter). Plywood drums with inside metal drums, spec. 2F (§ 178.25 of this subchapter).

(12) Spec. 12B (§ 178.205 of this subchapter). Fiberboard boxes constructed of at least 275-pound test double-faced fiberboard and provided with a perimeter liner and bottom pad of at least 200-pound test fiberboard. Boxes constructed of at least 350-pound fiberboard having top and bottom pads shall not require perimeter liner. Product must be contained within a tightly closed polyethylene or other equally efficient plastic bag constructed of material having minimum thickness of 0.004 inch. Not more than 25 pounds net weight of product may be packed in one outside box.

(13) Spec. 12A (§ 178.210 of this subchapter). Fiberboard boxes with inside glass bottles not over 5 pounds capacity each. Not more than four bottles having capacity of 5 pounds each, shall be packed in one outside container. Shipper must have established that completed package meets test requirements prescribed by § 178.210-10 of this subchapter.

(14) Spec. 12B (§ 178.205 of this subchapter). Fiberboard boxes with inside polyethylene bottles not over 1-gallon capacity each. Not more than four 1-gallon polyethylene bottles shall be packed in one outside fiberboard box. Authorized only for materials which will not cause decomposition of polyethylene or container failure.

§ 173.154a Fusees.

(a) A fusee is a device designed to burn at a controlled rate and to produce visible effects for signaling purposes. It consists of a pasteboard or fiber tube containing a colored flare mixture and with or without a means of support. The composition of the fusee must be such that spontaneous ignition does not occur when the moistened composition is exposed to a temperature of 212° F. for 72 consecutive hours. Fusees must have individual tip, head, or similar ignition point or surface entirely covered and securely protected against accidental contact or friction. Fusees must be securely packed in packages complying with the following specifications:

(1) Specifications 15A, 15B, 15C, 16A, 19A, or 19B (§§ 178.168, 178.169, 178.170, 178.185, 178.190, 178.191 of this subchapter). Wooden boxes having a gross weight not to exceed 150 pounds for specification 19B boxes; 200 pounds for the other boxes. When specification 15C boxes are used, devices must be packed in airtight inside metal receptacles.

(2) Specification 12B (§ 178.205 of this subchapter) fiberboard boxes. Boxes must have reinforced ends proven to be capable of preventing penetration of spikes through the outside box when a sample package, prepared as for shipment, is subjected to two drops from a height of 4 feet onto a solid surface. The package must be dropped so as to strike diagonally with the spikes in a downward position. Gross weight not to exceed 65 pounds except that gross weight not to exceed 75 pounds is authorized in boxes made in accordance with § 178.205-24 of this subchapter.

(3) Specification 29 (§ 178.226 of this subchapter). Mailing tubes, provided the

penetration of the spikes of the fusees through the outside container is prevented by the method specified for fiberboard boxes, specification 12B, in subparagraph (2) of this paragraph. Gross weight not to exceed 5 pounds.

(4) Fusees without spikes when offered for shipment may be packed in packages prescribed in this paragraph, omitting the protection required for these devices when equipped with spikes.

(5) Fusees may be packed with non-explosive or nonflammable articles provided the outside packages are marked as prescribed in this section.

(b) Each outside package must be plainly marked in letters not less than seven-sixteenths inch in height "Fusees" and with the additional words "Handle Carefully—Keep Fire Away."

§ 173.155 Bags, nitrate of soda, empty and unwashed.

(a) Bags, nitrate of soda, empty and unwashed, must be packed in specification containers as follows:

(1) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 178.168, 178.169, 178.170, 178.185, or 178.190 of this subchapter). Wooden boxes.

(2) [Reserved]

(b) Bags in truckload lots loaded by consignor and to be unloaded by consignee may also be shipped loose or baled, provided the highway vehicle is lined with paper and provision is made to prevent entrance of sparks.

§ 173.156 Barium peroxide and calcium peroxide.

(a) Barium peroxide and calcium peroxide must be packed in specification containers as follows:

(1) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 178.168, 178.169, 178.170, 178.185, or 178.190 of this subchapter). Wooden boxes with inside glass containers not over 1 pound capacity each; or with inside glass containers not over 5 pounds capacity each cushioned with incombustible cushioning material; or with inside metal containers or lining, spec. 2F (§ 178.25 of this subchapter).

(2) Spec. 6A (§ 178.97 of this subchapter). Metal barrels or drums. Gross weight not to exceed 880 pounds.

(3) Spec. 6B or 6C (§§ 178.98 or 178.99 of this subchapter). Metal barrels or drums with not more than 1400 pounds net weight in each container.

(4) Spec. 17E, 17H, 37A, or 37B (§§ 178.116, 178.118, 178.131, or § 178.132 of this subchapter). Metal drums (single-trip)

(5) Spec. 21C (§ 178.224 of this subchapter). Fiber drums. Authorized net weight not over 225 pounds.

§ 173.157 Benzoyl peroxide, chlorobenzoyl peroxide (para), cyclohexanone peroxide, dimethylhexane dihydroperoxide, lauroyl peroxide, or succinic acid peroxide, wet.

(a) Benzoyl peroxide, chlorobenzoyl peroxide (para), dimethylhexane dihydroperoxide, lauroyl peroxide, and succinic acid peroxide, each wet with at least 30 percent of water by weight, and cyclohexanone peroxide over 50 percent concentration but not exceeding 85 percent concentration, wet, must be packed in specification packagings as follows:

(1) Specification 15A, 15B, or 15C (§§ 178.168, 178.169, 178.170 of this subchapter). Wooden box with inside metal containers or lining, specification 2F (§ 178.25 of this subchapter), or with securely closed inside paper bags lined with polyethylene at least 0.002 inch thick, or with inside aluminum drums of at least 16 gage metal throughout. Net weight (dry weight) in each inside DOT-2F metal container or in each paper bag may not exceed 1 pound. Gross weight may not exceed 200 pounds.

(2) [Reserved]

(3) Specification 12B (§ 178.205 of this subchapter). Fiberboard box with inside fiber containers securely closed by taping or gluing, or with securely closed inside paper bags lined with polyethylene at least 0.002 inch thick. Net weight (dry weight) in each inside container may not exceed 1 pound. Except for lauroyl peroxide, wet, each inside container must be surrounded by asbestos or an equivalent fire-resistant cushioning material. Gross weight in specification 12B65 fiberboard box may exceed 65 pounds, but may not exceed 80 pounds, provided the net weight (dry weight) of the contents does not exceed 50 pounds.

(4) Specification 21C (§ 173.224 of this subchapter). Fiber drum with securely closed inside plastic containers made of polyethylene film at least 0.002 inch thick for cyclohexanone peroxide over 50 percent concentration but not exceeding 85 percent concentration and for dimethylhexane dihydroperoxide; with securely closed inside plastic containers made of polyethylene film at least 0.004 inch thick for benzoyl peroxide wet with at least 30 percent of water by weight. Authorized net weight (wet weight) in one outside drum may not exceed 50 pounds for cyclohexanone peroxide, 100 pounds for dimethylhexane dihydroperoxide, or 225 pounds for benzoyl peroxide.

(5) Specification 12B (§ 178.205 of this subchapter). Fiberboard box with securely closed inside plastic containers made of polyethylene film at least 0.004 inch thick. Net weight (dry weight) in each inside container may not exceed 10 pounds. Each inside container must be surrounded by asbestos or an equivalent fire-resistant cushioning material. Authorized only for benzoyl peroxide.

(b) Benzoyl peroxide, wet with at least 20 percent of water by weight, must be packed in specification packagings as follows:

(1) Specification 12B (§ 178.205 of this subchapter). Fiberboard box with securely closed inside paper bags lined with polyethylene at least 0.002 inch thick. Net weight (dry weight) in each bag may not exceed 1 pound. Each bag must be surrounded by asbestos or an equivalent fire-resistant cushioning material.

(2) Specification 21C (§ 178.224 of this subchapter). Fiber drum with securely closed inside plastic containers made of polyethylene film at least 0.004 inch thick. Net weight (dry weight) in each outside drum may not exceed 25 pounds.

(3) Specification 12B (§ 178.205 of this subchapter). Fiberboard box with securely closed inside plastic containers made of polyethylene film at least 0.004 inch thick. Net weight (dry weight) in each inside container may not exceed 10 pounds. Each inside container must be surrounded by asbestos or an equivalent fire-resistant cushioning material. Net weight (dry weight) in each outside box may not exceed 25 pounds.

§ 173.158 Benzoyl peroxide, dry; chlorobenzoyl peroxide (para) dry; cyclohexanone peroxide, dry; lauroyl peroxide, dry; or succinic acid peroxide, dry.

(a) Benzoyl peroxide, dry; chlorobenzoyl peroxide (para) dry; cyclohexanone peroxide over 50 percent concentration but not exceeding 85 percent concentration, dry; lauroyl peroxide, dry; or succinic acid peroxide, dry; must be packed in specification packagings as follows:

(1) Spec. 15A or 15B (§ 178.168 or § 178.169 of this subchapter). Wooden boxes, with inside fiber containers securely closed by taping or gluing, or inside securely closed paper bags lined with 0.002 inch thick polyethylene, not over 1 pound capacity each. Except for lauroyl peroxide, dry, each inside container must be surrounded by asbestos or fire-resistant cushioning material which will protect contents with equal efficiency. Net weight in outside container must not exceed 50 pounds, except that for lauroyl peroxide, dry, net weight not over 100 pounds is authorized.

(2) Spec. 21C (§ 178.224 of this subchapter) fiber drums. Authorized only for lauroyl peroxide, dry. Authorized net weight not over 100 pounds in one drum.

(3) Spec. 12B (§ 178.205 of this subchapter). Fiberboard boxes, with inside fiber containers securely closed by taping or gluing, or inside securely closed paper bags lined with polyethylene not less than 0.002 inch thick, not over 1 pound capacity each. Except for lauroyl peroxide, dry, each inside container must be surrounded by asbestos or fire-resistant cushioning material which will protect the contents with equal efficiency. Gross weight in Spec. 12B65 boxes may be more than 65 but not more than 80 pounds provided net weight of content does not exceed 50 pounds.

§ 173.159 Burnt cotton.

(a) "Burnt cotton" is cotton that has been on fire and from which the burnt portions have not been removed by re-picking. It must not be offered for transportation until at least 10 days have elapsed since the last evidence of fire in it.

(b) When burnt cotton is picked and baled, the separated unburnt cotton is

subject to the same regulations as cotton that has not been involved in a fire. See § 172.101 of this subchapter.

§ 173.160 Calcium chlorite and sodium chlorite.

(a) Calcium chlorite and sodium chlorite must be packed in specification containers as follows:

(1) Spec. 15A, 15B, 15C, 16A or 19A (§§ 178.168, 178.169, 178.170, 178.185 or 178.190 of this subchapter). Wooden boxes with inside containers which must be glass or earthenware not over 2¹/₄ pounds capacity each or metal not over 5 pounds capacity each.

(2) Spec. 6A, 6B, or 6C (§§ 178.97, 178.98 or 178.99 of this subchapter). Metal barrels or drums.

(3) Spec. 17E, 17H, 37A, or 37B (§§ 178.116, 178.118, 178.131 or 178.132 of this subchapter). Metal drums (single-trip).

§ 173.161 Calcium phosphide.

(a) Calcium phosphide must be packed in specification containers as follows:

(1) Spec. 15A or 15B (§§ 178.168 or 178.169 of this subchapter). Wooden boxes lined, spec. 2F (§ 178.25 of this subchapter), and with hermetically sealed inside containers.

(2) Spec. 6A, 6B, or 6C (§§ 178.97, 178.98, or 178.99 of this subchapter). Metal barrels or drums.

§ 173.162 Charcoal.

(a) Limited quantities of charcoal, as described in this paragraph, are excepted from labeling and specification packaging requirements of this subchapter. In addition, shipments are not subject to Part 172 or Part 177 of this subchapter.

(1) Charcoal, activated.

(2) Charcoal made from pine wood and processed so that it is not liable to heat dangerously or cause fires in transportation.

(3) Charcoal briquettes made from wood charcoal with starch and water, or tar, for a binder, which have been

screened and cooled to a temperature below 100° F., before being offered for transportation.

(4) Charcoal screenings made from "pinon" wood.

(5) Charcoal made from walnut shells, corn cobs, peach pits, and similar material, must be cooled and held not less than five days before shipment, and shipped in bags, barrels, or boxes. The five-day holding period shall not apply to charcoal briquettes screened and cooled to a temperature below 100° F. before being offered for transportation.

(6) Charcoal, lump, made by the old kiln or pit method by which long air exposure is provided before shipment.

(7) Charcoal, wood, except charcoal screenings, when packed in boxes or barrels.

(8) Charcoal, wood, when in bags in less-than-truckload shipments of not exceeding 2,000 pounds.

(9) [Reserved]

(10) Charcoal screenings or ground, crushed, granulated, or pulverized charcoal, from pit or kiln burned charcoal, provided the screenings or the material from which the ground charcoal is made has been exposed to the air for not less than 5 days prior to shipment or grinding (see paragraph (k) of this section).

(11) Special exceptions for shipment of charcoal in the ORM-D class are provided in Subpart N of this part.

(b) Charcoal made in round retorts must be transferred to air-tight metal cans for cooling, and must be kept in these cans for 24 hours or more. The charcoal after removal from these cans should be aired by spreading on a floor to a depth not exceeding 1 foot. This air exposure must last not less than 44 hours. Not less than 72 hours should elapse from the time the air exposure of the charcoal commences before the lump charcoal is placed in paper bags.

(1) The charcoal during this airing period must be protected from the weather, and exposed to good circulation of air. When the charcoal is aired on the floor for only 24 hours and then placed in burlap bags, it must be kept in the bags 80 hours before shipment. If the charcoal is not aired on the floor for at least 24 hours, it must be kept in the burlap bags for at least 96 hours before loading for shipment.

(c) Charcoal made in ovens in slatted cars should be kept for two periods of 24 hours each in first and secondary airtight cooling chambers respectively. After removing the charcoal from the secondary coolers it must be exposed to good air circulation, but protected from the weather for a period of not less than 44 hours.

(1) Not less than 72 hours must elapse from the time the air exposure of the charcoal commences before the lump charcoal is placed in paper bags.

(d) When fire occurs in charcoal during air exposure period, it should be extinguished with as little water as possible. Any charcoal wet in this way or otherwise must be dried, by again heating in the retorts or ovens, and cooled and aired in the usual way described in paragraphs (b) and (c) of this section, or the charcoal must be set aside and allowed to dry for not less than 30 days before shipment.

(e) Charcoal, lump, must be dry and free from screenings and brands.

(1) [Reserved]

(2) [Reserved]

(3) Lump charcoal may be shipped in bags, barrels or boxes.

(4) Lump charcoal, dry and free from screenings and brands, may be shipped in bulk in motor vehicles. Vehicle must be swept before loading and if it contained lime it must be thoroughly cleaned.

(f) Charcoal screenings consist of small pieces of charcoal varying from about one-half inch in the maximum dimension to grains of dust. These screenings are more liable to produce fires than other forms of charcoal. Charcoal screenings from wet charcoal or wet screenings or screenings which have been wet must not be offered for shipment unless they have been dried for not less than 12 hours in a retort or oven, and then subjected to not less than 10 days airing and cooling before shipment.

(1) Charcoal screenings must be stored in a dry place, in loosely piled bags, freely exposed to the air for not less than 20 days after separation from the lump before shipment.

(2) Screenings from pine-wood charcoal must be stored as above described for not less than five days before shipment.

(3) Charcoal screenings must be packed in cotton or jute bags of not greater than 4 bushels capacity.

(g) Charcoal ground, crushed, granulated, or pulverized is prepared from either lump charcoal or screenings.

(1) Lump charcoal used for the preparation of ground, crushed, granulated, or pulverized charcoal must be stored subject to ventilation, and protected from the weather for not less than 20 days after its removal from the coolers before milling; or the ground, crushed, granulated or pulverized charcoal must be stored in bags, subject to ventilation and protected from the weather for not less than 20 days before shipment. Lump charcoal made from pine wood must be stored as above described for not less than 5 days before milling. Ground, crushed, or granulated charcoal made by the "Stafford" process must be stored subject to ventilation and protected from the weather for not less than 7 days before shipment in lieu of the 20-days' storage otherwise prescribed.

(2) Charcoal screenings used for the preparation of ground, crushed, granulated, or pulverized charcoal must be stored in a dry place in loosely piled cotton or jute bags freely exposed to air for a period of not less than 20 days after separation from the lump charcoal, and before milling; or the ground, crushed, granulated, or pulverized charcoal must be stored in bags, subject to ventilation and protected from the weather for not less than 20 days before shipment. Charcoal screenings made from pine wood charcoal must be stored as above described not less than 5 days before milling.

(3) Ground, crushed, granulated, or pulverized charcoal must be packed in tight sift-proof wooden barrels or boxes containing not more than 4 bushels each; or in fiberboard boxes; or in unlined jute bags, or in strong unlined cotton bags, containing not more than 4 bushels each; or in paper-lined jute bags, or in paper bags, containing not more than 2½ bushels each. Whenever practicable, all boxes, barrels, or bags, after filling, should be allowed to remain open and freely exposed to the air, and protected from the weather for not less than 24 hours before being closed. Ground, crushed, granulated, or pulverized charcoal made from pine-wood charcoal should be so stored for not less than 72 hours before the packages are closed.

(h) [Reserved]

(i) See § 177.838 of this subchapter for loading in motor vehicles.

(j) [Reserved]

(k) Screenings, or ground, crushed, granulated, or pulverized charcoal, from pit or kiln burned charcoal, are considered as non-hazardous, provided the screenings or the material from which the ground charcoal is made has been exposed to the air for not less than 5 days prior to shipment or grinding.

(l) Reburned charcoal must be cooled and exposed to good fresh-air circulation for not less than five days after removal from the reburning furnaces and before being shipped or ground to produce ground or pulverized charcoal.

§ 173.163 Chlorate of soda, chlorate of potash, and other chlorates.

(a) Chlorate of soda, chlorate of potash, and other chlorates must be packed in specification containers as follows:

(1) Spec. 6A, 6B, or 6C (§§ 178.97, 178.98, or 178.99 of this subchapter). Metal barrels or drums.

(2) Spec. 17E, 17H, 37A, or 37B (§§ 178.116, 178.118, 178.131, or § 178.132 of this subchapter). Metal drums (single-trip).

NOTE 1: Specs. 37A and 37B. Metal drums for export service, marked for an authorized gross weight of 160 pounds, must be at least 24 gauge, metal throughout.

(3) Spec. 21C, 22A, or 22B (§ 178.224, § 178.196 or § 178.197 of this subchapter). Fiber or plywood drums with inside metal drums, spec. 2F (§ 178.25 of this subchapter). Authorized net weight not over 225 pounds.

(4) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 178.168, 178.169, 178.170, 178.185 or 178.190 of this subchapter). Wooden boxes with tightly closed inside containers which must be of metal not over 10 pounds capacity each; or of glass not over 5 pounds each; or of fiber, spec. 2G (§ 178.26 of this subchapter), not over 6 pounds capacity each.

(5) Spec. 12B (§ 178.205 of this subchapter). Fiberboard boxes with inside metal cans not over 5 pounds capacity each, closed air tight and with not over 25 pounds of chlorate in the outside container.

(6) [Reserved]

(7) Chlorate of soda, dry, is authorized for shipment in steel cargo tank vehicles or tight sift-proof covered hopper type motor vehicles. Cargo tank vehicles and hopper type motor vehicles must be thoroughly cleaned before loading.

(8) Spec. 12A (§ 178.210 of this subchapter). Fiberboard boxes with inside glass bottles not over 5 pounds capacity each. Not more than four bottles having capacity of 5 pounds each, shall be packed in one outside container. Shipper must have established that completed package meets test requirements prescribed by § 178.210-10 of this chapter.

§ 173.164 Chromic acid or chromic acid mixture, dry.

(a) Chromic acid and chromic acid mixture, dry, must be packaged as follows:

(1) Spec. 6A, 6B, or 6C (§§ 178.97, 178.98, or 178.99 of this subchapter). Metal barrels or drums.

(2) Specifications 17H or 37A (§§ 178.118, 178.131 of this subchapter) metal drums. A specification 37A metal drum constructed from 22-gauge steel throughout is authorized for a gross weight of 490 pounds or less when it is shipped in a truckload lot.

(3) Spec. 15A or 15B (§§ 178.168 or 178.169 of this subchapter). Wooden boxes, with inside glass bottles of not greater than 5 pounds capacity each, with closures securely fastened, each bottle individually packed in a tight metal container, and cushioned therein with incombustible mineral packing material; or with tightly closed metal inside containers, not over 10 pounds capacity each.

(4) Spec. 12A (§ 178.210 of this subchapter). Fiberboard boxes with inside glass bottles not over 5 pounds capacity each. Not more than four bottles having capacity of 5 pounds each, shall be packed in one outside container. Shipper must have established that completed package meets test requirements prescribed by § 178.210-10 of this subchapter.

(5) Spec. 12B (§ 178.205 of this subchapter). Fiberboard boxes with metal inside containers which must have closing device securely fastened by positive means (not friction), not over 1-gallon capacity each. Not more than 4 metal containers shall be packed in one outside box.

(6) Spec. 21C (§ 178.224 of this subchapter). Fiber drums lined with a saran plastic material having a minimum thickness of 0.002 inch. Authorized net weight not over 115 pounds.

§ 173.165 Coal, ground bituminous, sea coal, coal facings.

(a) Coal, ground bituminous, sea coal, coal facings, 90 percent of which will pass through a 100-mesh sieve, must be stored for at least six days after grinding, or if not so stored must be shipped in tight metal containers, or in tight, metal-bodied, covered motor vehicles.

(b) Coal, ground bituminous, which has been dried by heating before grinding must be packed in hermetically sealed metal-lined wooden boxes or air-tight metal containers.

§ 173.166 Cobalt resinate, precipitated, calcium resinate, and calcium resinate fused.

(a) Cobalt resinate, precipitated, calcium resinate, and calcium resinate fused, must be packed in specification containers as follows:

(1) Spec. 6A, 6B, or 6C (§§ 178.97, 178.98, or 178.99 of this subchapter). Metal barrels or drums.

(2) Spec. 17E, 17H, 37A, or 37B (§§ 178.116, 178.118, 178.131, or § 178.132 of this subchapter). Metal drums (single-trip).

(3) Spec. 14A or 15E (§§ 178.168 or 178.169 of this subchapter). Wooden boxes with air-tight metal inside containers.

§ 173.167 Cotton waste, oily.

(a) Cotton waste, oily with more than 5 percent of vegetable or animal oil must be packed as follows:

(1) In hermetically sealed metal-lined wooden boxes or air-tight metal containers.

§ 173.168 Lithium amide, powdered.

(a) Lithium amide, powdered, must be packed as follows:

(1) As prescribed in § 173.154(a) (1), (2), (3) and (II).

(2) Spec. 21C (§ 178.224 of this subchapter). Fiber drums with inside metal drums, spec. 2F (§ 178.25 of this subchapter). Authorized net weight not over 225 pounds.

§ 173.169 Fiber, burnt.

Fiber, burnt, must be packed in hermetically sealed metal-lined wooden boxes or airtight metal containers.

§ 173.170 Fibers or fabrics impregnated, saturated or coated.

Fibers or fabrics impregnated, saturated or coated with animal or vege-

table oils, or organic substances, manufactured articles or processed materials which are liable to spontaneous heating or combustion in transit must be packed in hermetically sealed metal-lined wooden boxes or airtight metal containers.

§ 173.171 Fish scrap or fish meal.

Fish scrap or fish meal containing less than 6 or more than 12 percent moisture (does not include wet acidulated fish scrap with moisture 40 to 55 percent) or which has not been sufficiently cooled after manufacture, or is liable to spontaneous heating in transit, must be packed in air-tight metal containers.

§ 173.172 Hair, wet.

Hair, wet, must not be offered for transportation except in open motor vehicles with metal bodies.

§ 173.173 Aluminum dross or magnesium dross.

Aluminum dross or magnesium dross must not be shipped when hot or when containing moisture liable to cause heating or fire during transportation.

§ 173.174 Iron sponge, spent oxide, spent iron mass, spent iron sponge.

(a) Iron sponge that has not been properly oxidized during manufacture must be packed in hermetically sealed metal-lined wooden boxes or air-tight metal containers.

(b) [Reserved]

(c) Spent oxide, spent iron mass, or spent iron sponge must be loaded in open highway vehicles with steel bodies.

§ 173.175 Lacquer base, or lacquer chips, dry.

(a) Lacquer base, or lacquer chips, dry, must be packed in specification containers as follows:

(1) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 178.168, 178.169, 178.170, 178.185, or 178.190 of this subchapter). Wooden boxes with inside metal containers, spec. 2F (§ 178.25 of this subchapter).

(2) Spec. 6A, 6B, or 6C (§§ 178.97, 178.98, or 178.99 of this subchapter). Metal barrels or drums.

(3) Spec. 17E, 17H, 37A, 37B, or 37C (§§ 178.116, 178.118, 178.131, 178.132, or 178.135 of this subchapter). Metal drums (single-trip), or spec. 37C (non-reusable container).

(4) Spec. 21C (§ 178.224 of this subchapter). Fiber drums. Authorized net

weight not over 225 pounds.

§ 173.176 Matches.

(a) Matches, when offered for transportation, must be of a type that will not ignite spontaneously when subjected for eight consecutive hours to a temperature of 200° F., in a properly conducted laboratory test. They must not exceed 3 inches in length, nor have a stick exceeding .015 square inch in cross-section area.

(b) For the purpose of this subchapter, matches are divided into two classes, viz: (1) "strike-any-where" and block matches and (2) "strike-on-box," book, and card matches. Strike-anywhere and block matches are those for the ignition of which a prepared surface is not required. Strike-on-box, book, and card matches are those matches intended to be ignited on a prepared surface. Book and card matches may be fastened to a cover or folder, or the prepared match strips may not be so attached or covered.

(c) **Packing.** Matches, strike-anywhere, must not be packed in the same outside package with any other article, except that book, card, and "strike-on-box" matches may be included when packed in separate inside containers.

(1) Matches, strike-anywhere, must be placed in individual containers consisting of an outer sliding shuck or cover and an inner holding tray or box, or securely closed chipboard or fiberboard boxes. Individual containers consisting of a holding tray or box with a top that telescopes over the box may be used. Boxes of suitable "hang-up" type may also be used if approved by the Bureau of Explosives. All match boxes, covers, and trays must be made of cardboard, wood, or metal, except that paper wrappings may be used for block or card matches.

(2) Individual containers must be wrapped in paper with not more than 12 boxes or individual containers in each paper-wrapped package, except that paper wrapping is not required for boxes that have a center holding or protecting strip of cardboard of the size and type detailed in subparagraph (3) of this paragraph placed over the matches in the manner specified or as otherwise provided herein. Paper-wrapped packages must be secured on the ends and on the

lapping side with glue, or similar satisfactory adhesive making each 12 boxes or less of matches a serviceably wrapped and well secured packages. Chipboard or fiberboard boxes constructed of material not less than 0.018 inch thick, having flaps secured by adhesive or closed by specially designed flaps or tabs formed to secure tight closures, are not required to be wrapped in paper.

(3) No individual container (not including card or block matches) shall contain more than 700 strike-anywhere matches in any one container, box, or package. When more than 300 matches are packed in any individual container, box, or package, the matches must be arranged in two nearly equal portions with the heads of the two portions placed in opposite directions. All individual containers containing 350 or more matches must have placed over the matches a center holding or protecting strip made of cardboard, which can be scored or bent without fracture, except the center holding strip shall not be required when matches are packed in chipboard or fiberboard boxes detailed in subparagraph (2) of this paragraph. This protecting strip shall be not less than 1¼ inches wide and shall be flanged down at least ¾ inch on each end to hold the matches in position when the container is nested into the shuck or cover or withdrawn therefrom.

(d) Matches, unless exempted in paragraph (g) or (h) of this section, must be packaged as follows:

(1) Spec. 15A (§ 178.168 of this subchapter). Wooden boxes, with inside containers; not over 100 pounds each.

(2) Spec. 12B or 12C (§ 178.205 or § 178.206 of this subchapter). Fiberboard boxes with inside containers; not over 60 pounds each. Fill-in pieces specified by § 178.205-14 or § 178.206-14 of this subchapter shall not be required.

(3) The maximum number of match boxes contained in any one case shall be as follows:

Number of boxes	Nominal number of matches per box
¼ gross.....	Not over 700.
1 gross.....	Not over 500.
2 gross.....	Not over 400.
3 gross.....	Not over 300.
5 gross.....	Not over 200.
12 gross.....	Not over 100.
20 gross.....	Over 50.
	Under 100.
25 gross.....	Not over 50.

(e) [Reserved]

(f) **Marking.** Outside containers of strike-anywhere matches shall show the name of the importer, distributor, or manufacturer and the brand or trademark under which such matches are manufactured and distributed to the trade. The name shall be printed in English.

(1) In addition, and separate therefrom, all outside containers shall have plainly marked thereon the words "STRIKE-ANYWHERE MATCHES".

(g) Matches, strike-on-box, book, and card are not subject to this subchapter if packed with no other articles in outside fiberboard or wooden boxes.

(h) Limited quantities of matches, strike-on-box, book, and card when packaged in outside fiberboard or wooden boxes may be packed in the same outside packaging with nonflammable materials. They must be compactly packed in tightly closed inside packagings or securely wrapped to prevent accidental ignition. When so packed, they are excepted from labeling and specification packaging requirements of this subchapter. The outside of each package must be marked "BOOK MATCHES," "STRIKE-ON-BOX MATCHES," or "CARD MATCHES," as appropriate. In addition, shipments are not subject to Part 172 or Part 177 of this subchapter.

§ 173.177 Motion-picture film and X-ray film.

(a) Motion-picture film and X-ray film (nitrocellulose base) must be packed in specification containers as follows:

(1) Spec. 32A or 32B (§§ 178.146 or 178.147 of this subchapter). Metal cases.

(2) Spec. 15A, 15B, or 15C (§§ 178.168, 178.169, or 178.170 of this subchapter). Wooden boxes with each reel in a tightly closed metal can, or strong cardboard or fiberboard box with cover held in place by adhesive tape or paper; gross weight not over 200 pounds.

(3) Spec. 12B (§ 178.206 of this subchapter). Fiberboard boxes complying with § 178.205-22(a)(1) of this subchapter; authorized for a single tightly closed inside metal can or strong cardboard or fiberboard box with cover held in place by adhesive tape or paper, not over 2,000 feet of film. Taped closure authorized.

(4) Spec. 12B (§ 178.205 of this subchapter). One-piece fiberboard boxes complying with § 178.205-22(a)(2) of this subchapter; authorized only when each film is in a tightly closed metal film-

reel can or strong cardboard or fiberboard box with cover held in place by adhesive tape or paper containing not over 2,000 feet (approximately) of film; cans or boxes to be adequately braced in center of box by fiberboard, at least 175-pound test, extending full depth of box. Gross weight not over 65 pounds. Closing of box must be effected by coating entire contact surfaces of flaps with efficient adhesive; stitched closure not authorized. Boxes that have been filled, shipped, and opened, are not authorized for reuse.

(5) Spec. 32C (§ 178.148 of this subchapter). Trunks with each film in standard metal film-reel can or strong cardboard or fiberboard box with cover held in place by adhesive tape or paper. Trunks to contain no material other than films in cans or boxes and projecting apparatus. The apparatus, as packed, must not be capable of creating an electric current.

(6) Spec. 12B (§ 178.205 of this subchapter). Fiberboard boxes complying with § 178.205-27 of this subchapter; authorized only for not more than two square inside metal cans containing not over 200 feet (approx.) of film each; gross weight not over 15 pounds. Taped closure authorized.

(b) Slow burning motion-picture film is excepted from the requirements of this subchapter, except when packed with flammable film.

§ 173.178 Calcium carbide.

(a) Calcium carbide must be packed as follows:

(1) In water-tight metal drums with rolled, folded top and bottom seams and with welded side seams. Closures must be of the friction-type or screw-type. Full open-top closures must be gasketed and equipped with leverlock or bolted clamping ring. Maximum rated capacity may not exceed 55 gallons.

(2) In water-tight, sift-proof, bulk metal containers.

(3) [Reserved]

(4) In water-tight, sift-proof, closed-top metal covered hopper motor vehicles.

§§ 173.179—173.181 [Reserved]

§ 173.182 Nitrates.

(a) Aluminum nitrate, ammonium nitrate (no organic coating), ammonium nitrate (organic coating), ammonium nitrate-carbonate mixture, ammonium

nitrate-phosphate, ammonium nitrate fertilizer,¹ (containing no more than 0.2 percent carbon), ammonium nitrate mixed fertilizer, barium nitrate, calcium nitrate (NOTE: The double salt of calcium and ammonium nitrate ($5\text{Ca}(\text{NO}_3)_2 \cdot \text{NH}_4\text{NO}_3 \cdot 10\text{H}_2\text{O}$) containing not more than 15.5 percent nitrogen and at least 12 percent water is not subject to the regulations in this subchapter), guanidine nitrate, lead nitrate, magnesium nitrate, nitrates, n.o.s., nitrate of soda and potash, nitro carbo nitrate (see Note 1), potassium nitrate, silver nitrate, sodium nitrate, and strontium nitrate must be packaged as follows:

(1) In wooden or fiberboard boxes with glass, metal, or other strong inside containers; in metal or fiber drums; in kegs or barrels; or in strong metal cans. When so packed, they are excepted from the specification packaging requirements of this Part.

NOTE 1. Nitro carbo nitrate is a mixture consisting substantially of inorganic nitrates and carbonaceous materials, in which none of the ingredients are explosive as defined in this part and which as packaged for shipment cannot be detonated by means of a No. 8 test blasting cap as described herein. (A No. 8 test blasting cap is one containing two grams of a mixture of 80 percent mercury fulminate and 20 percent potassium chlorate or a cap of equivalent strength.)

(b) Aluminum nitrate, ammonium nitrate (no organic coating), ammonium nitrate-carbonate mixture, ammonium nitrate-phosphate, ammonium nitrate fertilizer¹ (containing no more than 0.2 percent carbon) ammonium nitrate mixed fertilizer, barium nitrate, calcium nitrate, guanidine nitrate, nitrate of soda and potash, potassium nitrate, sodium nitrate, and strontium nitrate, in addition to containers prescribed in paragraph (a) of this section, may be packaged as follows:

(1) [Reserved]

(2) In bulk, in sift-proof closed or open type motor vehicles.

(3) [Reserved]

(4) In burlap bags not exceeding 200 pounds net weight, water-resistant, made tight against sifting, and made of not less than 7½-ounce burlap.

¹ Applies only to materials tested in accordance with and meeting the definition in The Fertilizer Institute's publication "Definition and Test Procedures for Ammonium Nitrate Fertilizer" dated May 7, 1971.

(5) Multiple-wall paper bags must be constructed as follows:

(i) At least 4-ply including moisture-barrier ply, and made tight against sifting. Maximum authorized net weight is 110 pounds. Completed package, filled to weight with product and closed for shipment, must be capable of withstanding three 4-foot drops on face or back onto solid concrete without rupture.

(ii) At least 3-ply of extensible kraft paper having a minimum total basis weight of 180 pounds including an innermost ply coated with polyethylene to provide a moisture barrier. Maximum authorized net weight is 80 pounds. Completed package, filled to weight with product and closed for shipment, must be capable of withstanding three 4-foot drops on face or back onto solid concrete without rupture.

(6) Plastic bags must be constructed as follows:

(i) Specification 44P (§ 178.241 of this subchapter). All plastic bags. Maximum authorized net weight is 81 pounds. Authorized only for ammonium nitrate mixed fertilizer, and ammonium nitrate fertilizer (containing no more than 0.2 percent carbon).

(ii) Polypropylene bag made of 9 denier polypropylene fibers spun continuously to form a sheet weighing at least 3½ ounces per square yard. Maximum authorized net weight is 100 pounds. Each bag must have an inner liner of polyethylene not less than 4 mils thick. Each bag filled to weight with product and closed for shipment must be capable of withstanding three 4-foot drops on face or back onto solid concrete without rupture. Authorized only for ammonium nitrate (no organic coating) and ammonium nitrate fertilizer; or

(iii) Polyethylene bag made of two plies of high-density polyethylene film laminated together so that the orientation of each ply of film is at right angles to the other. Maximum authorized net weight is 100 pounds. For a net weight not exceeding 50 pounds, the thickness of each bag must be at least 2.5 mils. For a net weight exceeding 50 pounds but not exceeding 100 pounds, the thickness of each bag must be at least 4 mils. Each bag must be capable of withstanding the test requirements of § 178.241-4 and each bag must be in compliance with the requirements of § 178.241-3 of this subchapter for bag closures. Authorized only

for ammonium nitrate (no organic coating), ammonium nitrate fertilizer, and sodium nitrate.

(7) Specification 53² or 56 (§§ 178.251, 178.252 of this subchapter). Portable tank. Authorized only for sodium nitrate.

(c) Nitro carbo nitrate, in addition to the packagings prescribed in paragraph (a) of this section, may be packaged as follows:

(1) Burlap bags, water-resistant, made tight against sifting and made of not less than 7½-ounce burlap. Maximum authorized net weight is 100 pounds.

(2) In multi-wall paper bags of at least 4-ply construction including moisture-barrier ply, and made tight against sifting. Maximum authorized net weight is 100 pounds. Completed package, filled to weight with product and closed as for shipment, must be capable of withstanding three 4-foot drops on the face or back onto solid concrete without rupture.

(3) Specification 44P (§ 178.241 of this subchapter). Plastic bag made of film not less than 0.005-inch thick. Authorized net weight not over 51 pounds. Each bag must be capable of withstanding the test requirements of § 178.241-4 of this subchapter.

(4) Specification 23G (§ 178.218 of this subchapter). Cylindrical fiberboard box. Maximum net weight not over 50 pounds.

§ 173.183 Potassium nitrate mixed (fused) with sodium nitrite.

(a) Potassium nitrate mixed (fused) with sodium nitrite must be packed in containers as follows:

(1) In containers as prescribed in § 173.182 (a).

§ 173.184 Nitrocellulose or collodion cotton, wet, or nitrocellulose, colloided, granular, or flake, wet, or nitrostarch, wet, or nitroguanidine, wet.

(a) Nitrocellulose or collodion cotton, wet, or nitrocellulose, colloided, granular, or flake, wet, or nitrostarch, wet, or nitroguanidine, wet, must be uniformly wet with at least 20 pounds of water to 80 pounds of dry material and must be packed in specification containers as follows:

(1) [Reserved]

(2) Spec. 14, 15A, or 15B (§ 178.165, § 178.168, or § 178.169 of this subchapter) Wooden boxes lined, spec. 2M (§ 178.31

of this subchapter).

(3) Spec. 6A, 6B, 6C, or 6J (§ 178.97, § 178.98, § 178.99, or § 178.100 of this subchapter). Metal barrels or drums not over 55 gallons capacity. Spec. 6J (§ 178.100 of this subchapter) drums must have removable heads of 14 gauge metal or 16 gauge metal with one or more corrugations near the periphery and heads must have a minimum convexity of ⅜ inch; each drum must have three rolled or swaged-in hoops, one of which shall be in the body near the top curl.

(4) Spec. 37A or 37B (§ 178.131 or § 178.132 of this subchapter). Metal drums (single-trip) not over 5 gallons capacity. Welded side seams required.

(5) Spec. 17E or 17H (§§ 178.116 or 178.118 of this subchapter). Metal drums (single-trip).

(6) Spec. 42 F (§ 178.110 of this subchapter). Aluminum barrels or drums.

(b) Gross weight of any container must not exceed 490 pounds.

§ 173.185 Paper stock, wet.

Paper stock, wet must be packed in hermetically sealed metal-lined wooden boxes or air-tight metal containers.

§ 173.186 Paper waste, wet.

Paper waste, wet, must be packed in hermetically sealed metal-lined wooden boxes or air-tight metal containers.

§ 173.187 Peroxide of sodium.

(a) Peroxide of sodium must be packed in specification containers as follows:

(1) Specification 15A, 15B, 15C, 16A, or 19A (§§ 178.168, 178.169, 178.170, 178.185, 178.190 of this subchapter). Wooden boxes with inside containers which must be air-tight metal cans.

(2) Spec. 6A, 6B, or 6C (§§ 178.97, 178.98, or 178.99 of this subchapter). Metal barrels or drums.

(3) Spec. 17E, 17H, 37A, or 37B (§§ 178.116, 178.118, 178.131, or § 178.132 of this subchapter). Metal drums (single-trip).

(4) Spec. 12A or 12B (§ 178.210 or § 178.205 of this subchapter). Fiberboard boxes with inside air-tight metal cans not over 5 pounds capacity each.

§ 173.188 Phosphoric anhydride.

(a) Phosphoric anhydride must be packed in specification containers as follows:

(1) Specification 15A, 15B, or 15C

² Use of existing tanks authorized. Construction not authorized after May 31, 1972.

(§§ 178.168, 178.169, 178.190 of this subchapter). Wooden boxes with inside containers which must be tightly stoppered glass bottles not over 1 pound capacity each; or metal cans, not over 3 pounds capacity each, hermetically sealed (soldered) or closed with cork securely held in place by metal strap soldered in position. All inside containers must be cushioned with elastic incombustible packing materials.

(2) Spec. 6A, 6B, or 6C (§§ 178.97, 178.98 or 178.99 of this subchapter). Metal barrels or drums.

(3) Spec. 17E, 17H, 37A, or 37B (§§ 178.116, 178.118, 178.131, or § 178.132 of this subchapter). Metal drums (single-trip).

(4) Specification 6K (§ 178.101 of this subchapter). Metal drums. Authorized only for truckload shipments loaded by the shipper and unloaded by the consignee or his duly authorized agent. Authorized net weight not over 600 pounds. If the gross weight is more than 480 pounds, the shipper must have established that the drums meet the drop test requirements prescribed in § 178.101-11 of this subchapter at 600 pounds gross weight.

(5) Spec. 12A (§ 178.210 of this subchapter). Fiberboard boxes with inside glass bottles not over 1 pound capacity each. Not more than 12 bottles shall be packed in one outside box. Shipper must have established that completed package meets test requirements prescribed by § 178.210-10 of this subchapter.

(6) Spec. 12A (§ 178.210 of this subchapter). Fiberboard boxes with inside glass bottles of one-third fluid ounce capacity each. Each bottle shall be packed in a heat-sealed polyethylene or other suitable plastic bag of equal efficiency and not more than 75 such units shall be packed in a heat-sealed polyethylene or other suitable plastic bag of equal efficiency, which shall be placed in a securely closed metal can. Not more than 1 can shall be packed in one outside box.

§ 173.189 Phosphorus, amorphous, red.

(a) Phosphorus, amorphous, red, must be packed in specification containers as follows:

(1) Spec. 15A or 15B (§§ 178.168 or 178.169 of this subchapter). Wooden boxes, with metal inside containers, with closures sealed air-tight and positively fastened.

(2) Spec. 6A or 6B; also 37A or 37B (single-trip containers) (§§ 178.97, 178.98, 178.131, or § 178.130 of this subchapter), for gross weight not over 160 pounds. Metal barrels or drums.

(3) Spec. 29 (§ 178.226 of this subchapter). Mailing tube having not more than 100 grams of phosphorous contained in an inside glass container, sealed under nitrogen or other inert gas, with an air tight closure. The glass container shall be packed in a metal can having air tight closure. Both the inside glass container and the metal can shall be surrounded on all sides with incombustible cushioning material.

§ 173.190 Phosphorus, white or yellow.

(a) Phosphorus, white or yellow, must be packed in water or dry.

(b) When placed in water it must be packed in specification containers as follows:

(1) Spec. 15A or 15B (§§ 178.168 or 178.169 of this subchapter). Wooden boxes with inside containers, which must be hermetically sealed (soldered) metal cans, inclosed in other hermetically sealed (soldered) metal cans; or hermetically sealed (soldered) metal cans, containing not over 1 pound each, inclosed in other, watertight, metal cans with screw-top closures; or hermetically sealed (soldered) metal cans, inclosed in hermetically sealed (soldered) metal box-lining, spec. 2F (§ 178.25 of this subchapter).

(2) Spec. 5A, 6A, or 6B (§§ 178.81, 178.97, or 178.98 of this subchapter). Metal barrels or drums, not over 30 gallons capacity each.

(3) [Reserved]

(4) Specification MC 310, MC 311, or MC 312 (§ 178.343 of this subchapter). Tank motor vehicles, without bottom outlet and with insulation at least 4 inches in thickness, except that 2 inches of insulation is authorized for tanks equipped with an exterior heating jacket. Interior heating coils are not authorized. The material must be immersed in water or be blanketed with an inert gas and be loaded at a temperature not exceeding 140° F. After unloading, the tank must be filled to its entire capacity with an inert gas or to its entire capacity with water having a temperature not exceeding 140° F.

(c) Phosphorus, white or yellow, must be packed in water in packaging as follows:

(1) [Reserved]

(2) Samples of phosphorus, white or yellow, not to exceed 4 ounces each, placed in water in sealed metal cylinders or cans, inclosed in a wooden box, spec. 15A or 15B (§§ 178.168 or 178.169 of this subchapter), may be transported only when consigned to the laboratory of the Internal Revenue Bureau or to the Hygienic Laboratory of the Public Health Service, Washington, D.C.

(3) Spec. 29 (§ 178.226 of this subchapter). Mailing tube having a watertight rigid polyethylene container in which is placed a quartz tube containing not more than 100 grams of phosphorus sealed under nitrogen or other inert gas, with the remaining space in the polyethylene container filled with water. The polyethylene container shall be cushioned within the mailing tube with incombustible cushioning material.

(d) Phosphorus, white or yellow, when dry must be cast solid and shipped in containers as follows:

(1) Spec. 6A, 6B, or 6C (§§ 178.97, 178.98, or 178.99 of this subchapter). Metal barrels or drums not over 30 gallons capacity each.

(2) In projectiles or bombs when shipped by, for, or to the Departments of the Army, Navy, and the Air Force of the United States Government, without bursting elements.

§ 173.191 Phosphorus pentachloride.

(a) Phosphorus pentachloride must be packed in specification containers as follows:

(1) Specification 15A, 15B, 15C, 16A, or 19A (§§ 178.168, 178.169, 178.170, 178.185, 178.190 of this subchapter). Wooden boxes with inside containers which must be glass or glazed earthenware containers, not over 25 pounds capacity each, cushioned with mineral packing; when inside containers are packed in the same outside container with other articles, they must be enclosed in tightly closed metal cans. Net weight of phosphorus pentachloride not over 50 pounds in each outside container.

(2) Spec. 6A, 6B, or 6C; also 37A or 37B (single-trip containers) (§§ 178.97, 178.98, 178.99, 178.131, or § 178.132 of this subchapter). "Black iron" metal barrels or drums.

(3) [Reserved]

(4) Spec. 28A (§ 178.9 of this subchapter) Metal-jacketed lead carboys.

§ 173.192 Picrate of ammonia (ammonium picrate), picric acid, trinitrobenzoic acid, and urea nitrate, wet.

(a) Picrate of ammonia (ammonium picrate), picric acid, trinitrobenzoic acid, and urea nitrate, wet with not less than 10 percent water, in quantity not exceeding 16 ounces in one outside package, may be shipped as drugs, medicines, or chemicals, when in glass bottles securely stoppered, each bottle inclosed in a strong fiber carton properly cushioned in the outside shipping case. No restrictions other than packing prescribed by this section are required when these materials are offered for transportation.

§ 173.193 Picric acid, trinitrobenzoic acid, or urea nitrate, wet.

(a) Picric acid, trinitrobenzoic acid, or urea nitrate, wet with not less than 10 percent water must be packed in specification containers as follows:

(1) Spec. 15A (§ 178.168 of this subchapter). Wooden box with inside containers of tightly closed glass or earthenware cushioned, in outside container. The net weight in an outside package must not exceed 25 pounds dry weight. (See § 173.65(e) for shipment of wet picric acid, wet trinitrobenzoic acid and wet urea nitrate in excess of 25 pounds, and § 173.192 for exemption up to 16 ounces.)

§ 173.194 Potassium permanganate.

(a) Potassium permanganate must be packed in specification containers as follows:

(1) In containers as prescribed in § 173.154.

(2) In bulk, in motor vehicles with steel, sift-proof, self-clearing hopper-type or dump-type bodies, with water-proof and dust-proof covers, well secured in place.

§ 173.195 Pyroxylin plastic scrap.

(a) Pyroxylin plastic scrap must be packaged as follows:

(1) Spec. 15A or 15B (§§ 178.168 or 178.169 of this subchapter). Wooden boxes lined, spec. 2F or 2M (§§ 178.25, or 178.31 of this subchapter); gross weight not over 450 pounds each.

(2) Spec. 6A, 6B, 6C, or 6J; also 17H, 37A, or 37B (single-trip containers) (§§ 178.97, 178.98, 178.99, 178.100, 178.118, 178.131, or § 178.132 of this subchapter).

Metal barrels or drums.

(3) [Reserved]

(4) [Reserved]

(5) Spec. 21C (§ 178.224 of this subchapter). Fiber drums. Must be externally treated to provide protection against moisture. Authorized net weight not over 225 pounds.

(b) Pyroxylin plastic scrap, photographic film scrap, X-ray film scrap, motion picture film scrap, or pieces of exposed or unexposed film which show evidence of decomposition or instability or are liable to decompose or become unstable must be packed submerged in water in specification containers as follows:

(1) Spec. 6A, 6B, or 6C; or 17H (single-trip) (§ 178.97, § 178.98, § 178.99, or § 178.118 of this subchapter). Metal barrels or drums.

(2) Spec. 15A, 15B, or 15C (§ 178.168, § 178.169, or § 178.170 of this subchapter). Wooden boxes with tightly closed inside metal containers.

§ 173.196 [Reserved]

§ 173.197 [Reserved]

§ 173.197a Smokeless powder for small arms.

Smokeless powder for small arms in quantities not exceeding 100 pounds net weight transported in one motor vehicle may be classed as a flammable solid when approved for this classification by the Bureau of Explosives. Maximum quantity in any inside packaging must not exceed 8 pounds and inside packagings must be arranged and protected to prevent simultaneous ignition of the contents. The complete package must be a type approved by the Bureau of Explosives. Each outside package must bear a flammable solid label.

§ 173.198 Sodium hydride.

(a) Sodium hydride must be packed in specification containers as follows:

(1) In containers as prescribed in § 173.206(a) (1) and (a) (2).

(2) Spec. 17H (§ 178.118 of this subchapter). Metal drums (single-trip).

(3) Spec. 37A or 37B (§ 178.131 or § 178.132 of this subchapter). Metal drums (single-trip) with welded side seams and hermetically sealed closure or closure made fast by positive pressure of

the lid against a rubber gasket with edge of the lid crimped over the lip of the drum and a protective metal ring fastened around the crimped edge, packed in strong outside wooden boxes.

§ 173.199 Rags, oily.

Rags, oily, with more than 5 percent of vegetable or animal oil, must be packed in hermetically sealed metal-lined wooden boxes, or air-tight metal containers.

§ 173.200 Rags, wet.

Rags, wet, must be packed in hermetically sealed metal-lined wooden boxes, or air-tight metal containers.

§ 173.201 Rubber scrap, rubber buffings, reclaimed rubber, or regenerated rubber.

(a) Rubber scrap, if ground, powdered, or pulverized, and the rubber content of which exceeds 45 percent, as determined by subtracting the sum of the percentage of ash and the percentage of acetone extract from 100; rubber buffings from any grade of rubber, irrespective of the percentage of rubber content; and reclaimed rubber or regenerated rubber, must be packed in specification containers as follows (see paragraph (b) of this section):

(1) Spec. 6A, 6B, or 6C (§§ 178.97, 178.98, or 178.99 of this subchapter). Metal barrels or drums.

(2) Spec. 15A (§ 178.168 of this subchapter). Wooden boxes lined, spec. 2F (§ 178.25 of this subchapter), or 2M (§ 178.31 of this subchapter).

(3) [Reserved]

(4) Spec. 12B (§ 178.205 of this subchapter). Fiberboard boxes.

(5) Spec. 21C (§ 178.224 of this subchapter). Fiber drums. Authorized net weight not over 225 pounds.

(6) Spec. 22A (§ 178.196 of this subchapter). Wooden drums.

(7) [Reserved]

(8) Spec. 36A, 36B, 36C, 44B, or 44E (§§ 178.230, 178.233, 178.234, 178.236, or 178.239 of this subchapter). Bags.

(b) Rubber scrap, reclaimed rubber, or regenerated rubber are not subject to this chapter if shipped in the following forms:

(1) Rubber scrap, not ground or ground with cord or fabric insertion, or ground without cord or fabric insertion the particles of which pass over a screen of not less than 5-mesh.

(2) Reclaimed rubber or regenerated rubber when in the form of dense ho-

ogeneous nonporous sheets or rolls, the sheets of thickness of $\frac{1}{8}$ inch or greater packed flat or in rolls, or in pelletized form if not less than $\frac{1}{4}$ inch in diameter, or ground, the particles of which pass over a screen of not less than 5-mesh, all properly cooled before shipment.

(3) Rubber scrap, reclaimed rubber or regenerated rubber in any form when shipped in tank or hopper trucks.

§ 173.202 Sodium and potassium, metallic liquid alloy.

(a) Sodium and potassium, metallic liquid alloy must be packed in specification containers as follows:

(1) Spec. 15A or 15B (§ 178.168 or § 178.169 of this subchapter). Wooden boxes with inside metal containers of a type approved by the Bureau of Explosives cushioned with incombustible cushioning material. Each container must have been tested hydrostatically to a pressure of not less than 60 pounds per square inch. Closing devices must be protected from injury. Not more than 300 pounds of sodium or potassium liquid alloy may be shipped in one outside container.

(2) Spec. 5A (§ 178.81 of this subchapter), metal barrels or drums not exceeding 400 pounds capacity each, having protruding valves protected by a 12-gauge steel dome securely attached to the head of the drum. Shipments are authorized by motor vehicle in truckload lots only.

(b) Packaging of metallic liquid alloys of sodium or potassium in combination with fissile or large quantities of radioactive material, is authorized as provided in § 173.206(a)(10) and (11).

§ 173.203 Tetranitromethane.

(a) Tetranitromethane must be packed in specification containers as follows:

(1) Spec. 15A or 15B (§§ 178.168 or 178.169 of this subchapter). Wooden boxes, gross weight not exceeding 150 pounds, with inside containers which must be: glass bottles not more than 1 quart capacity each, with closures securely fastened and of a type not deteriorated by the contents, each bottle individually packed in a tight metal container and cushioned therein with absorbent incombustible material; or aluminum cans or polyethylene bottles, not more than 5 pounds capacity each, with opening not more than 1.25 inches diameter, fitted with securely fastened screw type clo-

sures and gaskets of material not deteriorated by contact with the contents, cushioned with not less than 2 inches of absorbent incombustible cushioning material between the inside containers and any part of the wooden box.

(2) Spec. 6A, 6B, or 6C (§§ 178.97, 178.98, or 178.99 of this subchapter). Metal barrels or drums, with inside stainless steel or aluminum drum (or drums) having no opening exceeding 2.5 inches diameter, openings to be securely closed by a screw type gasketed device, with gaskets of material not deteriorated by contact with the contents. The inside drum (or drums) must be cushioned with not less than 2 inches of absorbent incombustible cushioning material; inside drums shall be of not less than 20 gauge metal and shall be tested for leakage before packing in the outside drum.

§ 173.204 Sodium hydrosulfite.

(a) Sodium hydrosulfite must be packed in specification containers as follows:

(1) Specification 15A, 15B, 15C, 16A, or 19A (§§ 178.168, 178.169, 178.170, 178.185, 178.190 of this subchapter). Wooden boxes with inside glass bottles of capacity not exceeding 5 pounds each, or metal containers.

(2) Spec. 6A, 6B, or 6C (§§ 178.97, 178.98, or 178.99 of this subchapter). Metal barrels or drums.

(3) Spec. 17E, 17H, or 37K (§§ 178.116, 178.118, or 178.130 of this subchapter) **Metal drums (single-trip).**

(4) Specification 37A or 37B (§§ 178.131, 178.132 of this subchapter). **Metal drums (STC).**

(5) Spec. 21C (§ 178.224 of this subchapter). Fiber drums with inside metal drums. Authorized net weight not over 225 pounds.

(6) Spec. 21C (§ 178.224 of this subchapter). Fiber drums. Authorized net weight of product not over 250 pounds; drums must have a metal foil (laminated between two sheets of kraft paper with thermoplastic adhesive) moisture and water barrier wound into the sidewall of the drum and located not more than 2 plies from the interior of drum but not to be wound as the first ply; a metal foil moisture and water barrier must also be present in the fiber or wood heading; exterior of drum sidewall must be protected with a water resistant coating; in addition to the tests prescribed by § 178.224-2 (a), (b), and (c) of this subchapter, a

drum having been given a 4-foot diagonal bottom chime drop must, after being emptied, withstand complete immersion of the bottom in 6 inches of water for 4 hours without leakage to the interior.

(7) Spec. 22B (§ 178.197 of this subchapter). Plywood drums with inside metal drums.

(8) Specification 56 (§§ 178.251, 178.252 of this subchapter). Portable tank. Authorized only for shipment in a closed transport vehicle.

§ 173.205 Sodium picramate, wet.

(a) Sodium picramate must be wet with not less than 20 percent of water by weight and packed in specification containers as follows:

(1) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 178.168, 178.169, 178.170, 178.185, or 178.190 of this subchapter). Wooden boxes with well stoppered glass inside containers of not exceeding 1 quart capacity each, cushioned in the boxes.

§ 173.206 Sodium or potassium, metallic; sodium amide; sodium potassium alloys; sodium aluminum hydride; lithium metal; lithium silicon; lithium ferro silicon; lithium hydride; lithium borohydride; lithium aluminum hydride; lithium acetylide-ethylene diamine complex; aluminum hydride; cesium metal; rubidium metal; zirconium hydride, powdered.

(a) Metallic sodium or potassium, sodium amide, sodium potassium alloys, sodium aluminum hydride, lithium metal, lithium silicon, lithium ferro silicon, lithium hydride, lithium borohydride, lithium aluminum hydride, lithium acetylide-ethylene diamine complex, aluminum hydride, cesium metal, rubidium metal, and powdered zirconium hydride must be packaged as follows:

(1) Specification 15A, 15B, 19A, or 19B (§§ 178.168, 178.169, 178.190, 178.191 of this subchapter). Wooden boxes must have inside air-tight metal packagings. Each inside air-tight metal packaging must have a closing device securely fastened by positive means (not friction). For shipments of lithium aluminum hydride, each inside metal packaging must not exceed 1 gallon capacity and must be securely closed, positive means not required. Each inside metal packaging containing lithium aluminum hydride must be cushioned in outside packagings with sufficient incombustible packaging material.

(2) Specification 5, 6A, 6B, or 6C (§§ 178.80, 178.97, 178.98, 178.99 of this subchapter). Metal barrels or drums. Not authorized for lithium aluminum hydride or aluminum hydride.

(3) Spec. 17E, 17H, 37A, or 37B (§§ 178.116, 178.118, 178.131, or 178.132 of this subchapter). Metal drums (single-trip). Authorized only for lithium metal or sodium, metallic which must be fused solid in the container.

(4) Spec. 37A or 37B (§ 178.131 or § 178.132 of this subchapter). Metal drums (single-trip) not exceeding 6 gallons capacity each, with welded side seams and hermetically sealed closure or closure made fast by positive pressure of the lid against a rubber gasket with edge of the lid crimped over the lip of the drum and a protective metal ring fastened around the crimped edge, cushioned on all sides with incombustible packing material, packed in strong outside wooden boxes (see § 173.25). Not more than four inside metal drums shall be packed in one outside wooden box.

(5) Spec. 17C (§ 178.115 of this subchapter), metal drums (single-trip). Not authorized for lithium aluminum hydride.

(6) Spec. 17H or 37A (§ 178.118 or § 178.131 of this subchapter). Metal drums (single-trip), with air-tight metal inside containers which must have closing device securely fastened by positive means (not friction). Inside metal containers must be cushioned on all sides by incombustible packing material. Authorized for lithium metal or lithium hydride only.

(7) Spec. 12B (§ 178.205 of this subchapter). Fiberboard boxes constructed of at least 375-pound test (Mullen or Cady) solid fiberboard with inside air-tight metal container which must have a closing device securely fastened by positive means (not friction). Each inside metal container must be individually nested into a double-faced corrugated partition of at least 200-pound test (Mullen or Cady) which is in turn surrounded on all sides by a peripheral double-walled corrugated liner of at least 200-pound test (Mullen or Cady). Authorized gross weight not over 90 pounds.

(8) Spec. 21C (§ 178.224 of this subchapter). Fiber drums constructed for 400 pounds net weight, with the material packed not more than 5 pounds net weight each in not to exceed one-half gallon steel cans equipped with friction-

top closures. Authorized for lithium ferro silicon only.

(9) Spec. 12B (§ 178.205 of this subchapter). Fiberboard boxes with non-sparking inside metal cans securely closed by use of plastic tape, or other efficient means to provide moisture tight seal. Authorized only for lithium metal in ribbon form not over $\frac{1}{2}$ inch wide and $\frac{1}{16}$ inch thick. Lithium metal ribbon must be coated with heavy mineral oil or petrolatum and be wound on motion picture film reels not over 1,600-foot capacity each.

(10) Tubes of stainless steel, or other metals of equivalent strength and non-reactivity, having sealed, welded end caps, and containing not more than 50 grams of metal. Authorized only for metallic sodium, metallic lithium, metallic potassium, and sodium potassium alloy. Each tube must be enclosed within a secondary sealed metallic tube and further enclosed within strong tight outer packaging.

(11) Specification 12 B (§ 178.205 of this subchapter). Fiberboard box. Authorized only for lithium metal in wire form. Fiberboard box must have inside nonsparking metal packaging. Each inside nonsparking metal packaging must be tin coated and sealed by rolled-on lids. The contents of each inside packaging must be coated with heavy mineral oil or petroleum and wound on a 3-inch by 3-inch nonsparking metal spool. The net weight of the contents in each inside packaging must not exceed one-fourth pound.

(12) Any packaging as prescribed in §§ 173.394(b) or (c), 173.395(b) or (c), or 173.396(b) or (c).

(b) Sodium or potassium, metallic, sodium amide, and lithium metal, immersed in neutral oil may also be shipped when packed in specification containers as follows:

(1) Spec. 15A or 15B (§ 178.168 or § 178.169 of this subchapter). Wooden boxes with inside metal drums, spec. 37A or 37B (§ 178.131 or § 178.132 of this subchapter) single-trip, having welded side seams, net weight not over 30 pounds, or with inside glass containers, each enclosed in a tin container.

(2) Spec. 17H (§ 178.118 of this subchapter). Metal drum (single-trip). Authorized only for lithium metal in the form of cups or ingots.

(c) Sodium, metallic, may also be shipped when packed in specification containers as follows:

(1) [Reserved]

(2) Spec. 17C, 17H, 37A, or 37B (§§ 178.115, 178.118, 178.131, or § 178.132 of this subchapter). Metal drums (single-trip) authorized for cylindrical blocks at least 2 inches in diameter and not less than 6 inches in length, or rectangular blocks not less than 6 inches in length and not less than 2 inches in any other dimension. Net weight not over 300 pounds for spec. 17C drums; not over 30 pounds for spec. 17H, 37A, or 37B drums.

(3) Specification MC 330 or MC 331 (§ 178.337 of this subchapter). Tank motor vehicles having a minimum design pressure of 150 pounds per square inch and having exterior coils fusion-welded to the tank shell and properly stress-relieved. Tanks must be equipped with safety valves having a start-to-discharge pressure not exceeding 150 pounds per square inch. The material must be in molten condition when loaded and solidified before being moved over a public highway. Outage must be 5 percent or more at a sodium temperature of 208° F.

(4) Specification 51 (§ 178.245 of this subchapter). Portable tank. Each tank must have a minimum design pressure of 150 p.s.i.g. Each tank must be equipped with safety valves having a start-to-discharge pressure of 150 p.s.i.g. If a tank has exterior heating coils these coils must be welded to the tank and must be stress relieved. The material must be in molten condition when loaded and the tank must be held for sufficient time to allow the material to be completely solidified before being offered for transportation. Outage must be five percent or more at sodium fusion temperature of 208° F.

(d) Limited quantities of lithium metal in cartridges or rubidium metal in cartridges is excepted from labeling and specification packaging requirements, when packaged according to the following paragraph. In addition, shipments are not subject to Part 172 or Part 177 of this subchapter.

(e) Lithium metal or rubidium metal in cartridges, containing more than 18 grams but not more than 120 grams of lithium or rubidium, must be packed in specification packagings as follows:

(1) Specification 15A or 15B (§§ 178.168, 178.169 of this subchapter). Wooden boxes, not over 75 pounds gross weight, with air-tight inside copper cartridges. Cartridges having less than 0.022-inch wall thickness must be separated or securely cushioned in the boxes. Each cartridge must have a minimum wall thickness of 0.02-inch.

§ 173.207 Sulfide of sodium or sulfide of potassium, fused or concentrated, when ground.

(a) Sulfide of sodium or sulfide of potassium, fused or concentrated, when ground, must be packed in specification containers as follows:

(1) Spec. 15A, 15B, 15C, or 16A (§§ 178.168, 178.169, 178.170, or 178.185 of this subchapter). Wooden boxes with inside containers which must be glass bottles enclosed in tightly closed metal cans, or hermetically sealed (soldered) metal cans.

(2) Spec. 6A, 6B, or 6C (§§ 178.97, 178.98, or 178.99 of this subchapter). Metal barrels or drums.

(3) Spec. 12B (§ 178.205 of this subchapter). Fiberboard boxes, with inside containers which must be hermetically sealed (soldered) metal cans of not over 5 pounds capacity.

(b) When fused or concentrated, but not ground (may be chipped, flaked, or broken), may be shipped in specification containers as follows:

(1) Spec. 15A, 15B, 15C, or 16A (§§ 178.168, 178.169, 178.170, or 178.185 of this subchapter). Wooden boxes with inside bottles of not more than 5 pounds capacity each, or metal cans, with tight covers.

(2) Spec. 12B (§ 178.205 of this subchapter). Fiberboard boxes with inside containers which must be metal cans of not over 5 pounds net weight each or glass bottles of not over 1 pound net weight each. Packages containing glass or earthenware containers must not weigh over 65 pounds gross.

(3) Spec. 17E, 17H, 37A, or 37B (§§ 178.116, 178.118, 178.131, or 178.132 of this subchapter). Metal drums (single-trip)

(4) Spec. 6A, 6B, or 6C (§§ 178.97, 178.98, 178.99 of this subchapter). Metal barrels or drums.

(5) Spec. 21C (§ 178.224 of this subchapter). Fiber drums which must be lined or coated, or otherwise treated so as to prevent the entrance of moisture in quantities sufficient to create a hazard-

ous condition in transportation; maximum loaded capacity 250 pounds net.

(6) Spec. 12B (§ 178.205 of this subchapter). Fiberboard boxes constructed of at least 275-pound test double-faced fiberboard and provided with a perimeter liner and bottom pad of at least 200-pound test fiberboard. Boxes constructed of at least 350-pound fiberboard having top and bottom pads shall not require perimeter liner. Product must be contained within a tightly closed polyethylene or other equally efficient plastic bag constructed of material having minimum thickness of 0.004 inch. Not more than 25 pounds net weight of product may be packed in one outside box.

(7) Spec. 12A (§ 178.210 of this subchapter). Fiberboard boxes with inside glass bottles not over 5 pounds capacity each. Not more than four bottles having capacity of 5 pounds each shall be packed in one outside box. Shipper must have established that completed package meets test requirements prescribed by § 178.210-10 of this subchapter.

(c) Sulfide of potassium, crystallized, is not subject to this chapter.

(d) Sodium sulfide when shipped fused in one solid mass in a metal barrel or drum and sodium sulfide, crystallized, are not subject to this chapter.

(e) Sodium sulfide containing 35 percent or more combined water by weight, fused or concentrated but not ground (may be chipped, flaked, or broken), when packed in steel barrels or drums or portable metal tanks that are equipped with moisture-tight closures, or in strong tight fiber drums having a moisture-barrier incorporated in the walls and equipped with moisture-tight closures, is not subject to this chapter. Portable tanks filled to gross weight to be shipped must be capable of withstanding a drop from a height of 4 feet onto solid concrete without rupture or serious damage, and must be equipped with lifting devices capable of holding 4 times the gross weight of filled tank.

§ 173.208 Titanium metal powder, wet or dry.

(a) *Titanium metal powder, wet.* Titanium metal powder, wet, with not less than 20 percent water, must be packed in specification containers as follows:

(1) Spec. 15A or 15B (§§ 178.168 or 178.169 of this subchapter). Wooden boxes with inside metal cans not exceeding 1 gallon each, tightly and securely

closed, and not more than 12 such inside metal cans in one outside package; or not more than 1 inside metal can of not less than 22-gauge metal and not to exceed 10 gallons capacity, tightly and securely closed.

(2) Titanium metal powder, wet, with not less than 50 percent water by weight may be packed in any full removable head drum specified in § 173.154.

(b) *Titanium metal powder, dry.* Titanium metal powder, dry, must be packed in specification containers as follows:

(1) Spec. 15A or 15B (§§ 178.168 or 178.169 of this subchapter). Wooden boxes with inside metal containers, tightly and securely closed by push-in covers, held in place by soldering at least four points, or in screw-cap metal cans. Inside containers must not exceed 10 pounds net each. Inside containers must be cushioned by incombustible material such as rock wool or asbestos wool. Gross weight of outside package must not exceed 75 pounds each.

(2) Spec. 17H or 37A (§ 178.118 or § 178.131 of this subchapter). Metal barrels or drums (single-trip) with inside metal drum of not less than 20-gauge metal and with closure secured by positive means. The inside container shall be completely surrounded by not less than 1 inch of incombustible cushioning material.

(3) Spec. 5B (§ 178.82 of this subchapter). Metal barrels or drums not over 15 gallons capacity.

§ 173.209 Tankage, garbage, and tankage fertilizers.

Tankage, garbage, and tankage fertilizers, containing less than 8 percent moisture or having a temperature exceeding 100° F. when loaded must be packed in hermetically sealed metal-lined wooden boxes or air-tight metal containers.

§ 173.210 Tankages, rough ammoniate.

Tankages, rough ammoniate (tankages made from ammoniates such as leather scrap, horns, hoofs, hair, hair waste, felt waste), containing less than 7 percent moisture or having a temperature exceeding 100° F. when loaded, must be packed in hermetically sealed metal-

lined wooden boxes or air-tight metal containers.

§ 173.211 Textile waste, wet.

Textile waste, wet, must be packed in hermetically sealed metal-lined wooden boxes or air-tight metal containers.

§ 173.212 Trinitrobenzene and trinitrotoluene, wet.

Trinitrobenzene and trinitrotoluene, wet with not less than 10 percent water, in quantity not exceeding 16 ounces in one outside package, may be shipped as drugs, medicines, or chemicals, when in glass bottles securely stoppered, each bottle enclosed in a strong fiber carton properly cushioned in the outside shipping case and are not subject to any other requirement of this chapter.

§ 173.213 Wool waste, wet.

Wool waste, wet, must be packed in hermetically sealed metal-lined wooden boxes or air-tight metal containers.

§ 173.214 Hafnium metal or zirconium metal, wet, minimum 25 percent water by weight, mechanically produced, finer than 270 mesh particle size; hafnium metal or zirconium metal, dry, in an atmosphere of inert gas, mechanically produced, finer than 270 mesh particle size; hafnium metal or zirconium metal, wet, minimum 25 percent water by weight, chemically produced (see Note 1), finer than 20 mesh particle size; hafnium metal or zirconium metal, dry, in an atmosphere of inert gas, chemically produced (see Note 1), finer than 20 mesh particle size.

NOTE 1: Produced by means other than attrition or grinding.

NOTE 2: Any product containing 10 percent or more, particle size specified, shall be subject to this section.

NOTE 3: Any product containing less than 25 percent water by weight is considered dry for purposes of these regulations.

(a) Hafnium metal, wet, mechanically produced finer than 270 mesh particle size or chemically produced finer than 20 mesh particle size with a minimum of 25 percent water by weight (a mixture of water and a suitable anti-freeze agent may be used when freezing temperatures may be encountered during transportation) must be packed in specification containers as follows:

(1) Spec. 15A or 15B (§ 178.168 or 178.169 of this subchapter) wooden boxes or spec. 6A, 6B, or 6C (§ 178.97, 178.98, or 178.99 of this subchapter) metal drums with inside containers of glass or non-carbon polyethylene having net weight of not over 10 pounds each. Inside glass containers must be equipped with positive type clamp-on closures equipped with rubber gaskets. Inside polyethylene containers may have screw-cap closures equipped with gaskets ahead of thread and shall be of material which will not react with or be decomposed when in contact with contents. Screw-cap closures must be secured in place by suitable tape. Each glass or polyethylene container must be surrounded on all sides with not less than 1 inch of incombustible cushioning material and in an amount sufficient to completely absorb the entire liquid contents of the containers. Each inside glass or polyethylene container must be placed in a spec. 2A (§ 178.20 of this subchapter) metal can closed with push-in cover held in place by soldering or crimping at at least four points. Authorized net weight of hafnium in one outside container shall not exceed 40 pounds for wooden boxes and shall not exceed 150 pounds for steel drums.

(2) [Reserved]

(b) Hafnium metal, dry, in an atmosphere of inert gas, mechanically produced finer than 270 mesh particle size or chemically produced finer than 20 mesh particle size must be packed in specification containers as follows:

(1) Spec. 6A, 6B, or 6C (§ 178.97, 178.98, or 178.99 of this subchapter) or spec. 17C, 17H, or 37A (single-trip containers) (§ 178.115, 178.118, or 178.131 of this subchapter). Metal barrels or drums with inside non-carbon polyethylene bottles having positive type clamp-on closures equipped with rubber gaskets, or with screw-cap closures having not less than three continuous threads and equipped with gaskets ahead of threads,

not over 5 pounds net weight capacity each. Screwcap closures must be secured in place by suitable tape. Each bottle must be placed in a spec. 2R (§ 178.34 of this subchapter) metal container having a wall thickness of one-fourth inch and be completely surrounded by cushioning material. Spec. 2R containers must be separated from one another by incombustible cushioning material. Authorized net weight of metal in one outside container not over 150 pounds.

(c) Zirconium metal, wet, mechanically produced finer than 270 mesh particle size or chemically produced finer than 20 mesh particle size with a minimum of 25 percent water by weight (a mixture of water and a suitable anti-freeze agent may be used when freezing temperatures may be encountered during transportation) must be packed in specification containers as follows:

(1) Spec. 15A or 15B (§ 178.168, or 178.169 of this subchapter) wooden boxes or spec. 6A, 6B, or 6C (§ 178.97, 178.98, or 178.99 of this subchapter) or 17C or 17H (single-trip containers) (§ 178.115 or 178.118 of this subchapter) metal drums with inside containers of glass or non-carbon polyethylene having net weight of not over 10 pounds each. Inside glass containers must be equipped with positive type clamp-on closures equipped with rubber gaskets. Inside polyethylene containers may have screw-cap closures equipped with gaskets ahead of thread and shall be of material which will not react with or be decomposed when in contact with contents. Screw-cap closures must be secured in place by suitable tape. Each glass or polyethylene container must be surrounded on all sides with not less than 1 inch of incombustible cushioning material and in an amount sufficient to completely absorb the entire liquid contents of the containers. Each inside glass or polyethylene container must be placed in a spec. 2A (§ 178.20 of this subchapter) metal can closed with push-in cover held in place by soldering or crimping at at least four points. Authorized net weight of zirconium in one outside container shall not exceed 40 pounds in wooden boxes and 150 pounds in steel drums.

(2) [Reserved]

(3) Spec. 37P (§ 178.133 of this subchapter). Steel drums with polyethylene liner of one-piece molded construction

(nonreusable container) not over 5 gallons capacity each. Drums exceeding 1 gallon capacity must be constructed of at least 24-gauge metal.

(4) Specification 37M (§ 178.134 of this subchapter). Cylindrical steel overpack with inside specification 2S (§ 178.35 of this subchapter) polyethylene container. Each overpack must be constructed of at least 24-gage steel. Each packaging may not exceed a capacity of 5 gallons. Net weight of contents may not exceed 50 pounds of dry material.

(d) Zirconium metal, dry, in an atmosphere of inert gas, mechanically produced finer than 270 mesh particle size or chemically produced finer than 20 mesh particle size must be packed in specification containers as follows:

(1) Spec. 6A, 6B, or 6C (§ 178.97, 178.98, or 178.99 of this subchapter) or spec. 17C, 17H, or 37A (single-trip containers) (§ 178.115, 178.118, or 178.131 of this subchapter). Metal barrels or drums with inside non-carbon polyethylene bottles having positive type clamp-on closures equipped with rubber gaskets, or with screw-cap closures having not less than three continuous threads and equipped with gaskets ahead of threads, not over 5 pounds net weight capacity each. Screw-cap closures must be secured in place by suitable tape. Each bottle must be placed in a spec. 2R (§ 178.34 of this subchapter) metal container having a wall thickness of one-fourth inch and be completely surrounded by cushioning material. Spec. 2R containers must be separated from one another by incombustible cushioning materials. Authorized net weight of metal in one outside container not over 150 pounds.

(e) Mechanically produced hafnium metal, coarser than 270 mesh particle size and chemically produced coarser than 20 mesh particle size in strong tight containers are not subject to this chapter.

(f) Mechanically produced zirconium metal, coarser than 270 mesh particle size and chemically produced coarser than 20 mesh particle size in strong tight containers are not subject to this chapter. (See § 173.220, zirconium scrap.)

§ 173.215 [Reserved]

§ 173.216 Zirconium picramate, wet.

(a) Zirconium picramate must be wet with not less than 20 percent of water by weight and packed in specification containers as follows:

(1) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 178.168, 178.169, 178.170, 178.185, or 178.190 of this subchapter). Wooden boxes with well stoppered glass inside containers of not exceeding 1 quart capacity each, cushioned in the boxes.

§ 173.217 Calcium hypochlorite mixture, dry; lithium chlorite mixture, dry; mono-(trichloro) tetra - (monopotassium dichloro)-penta-s-triazinetri- trione, dry; potassium dichloro-s-triazinetri- one, dry; sodium dichloro-s-triazinetri- one, dry trichloro-s-triazinetri- one, dry.

(a) Calcium hypochlorite mixture, dry, lithium hypochlorite mixture, dry, mono-(trichloro) tetra-(monopotassium dichloro)-penta-s-triazinetri-
trione, dry, potassium dichloro-s-triazinetri-
one, dry, sodium dichloro-s-triazinetri-
one, dry, and trichloro-s-triazinetri-
one, dry, each containing more than 39 percent available chlorine must be packaged as follows:

(1) Spec. 6A, 6B, or 6C (§§ 178.97, 178.98, or 178.99 of this subchapter). Metal barrels or drums.

(2) Spec. 17E, 17H, 37A, or 37B (§§ 178.116, 178.118, 178.131, or § 178.132 of this subchapter). Metal drums (single-trip).

(3) Spec. 21C (§ 178.224 of this subchapter). Fiber drums with inner ply a laminated sheet of paper and aluminum foil, internally coated with not less than a 0.002 inch thickness of polyethylene. Cover of drum shall be gasketed. Authorized net weight not over 400 pounds.

(4) Specification 21C (§ 178.224 of this subchapter). Fiber drum with commodity packed in securely closed polyethylene bag constructed of polyethylene film not less than 0.004-inch thickness. Not authorized for calcium hypochlorite mixtures and lithium hypochlorite compounds, dry.

(5) Specification 21C (§ 178.224 of this subchapter). Fiber drum must be made with integral inner body ply having 0.010-inch minimum aluminum facing

and bottom interior with 0.001-inch minimum aluminum facing. Cover of drum must be gasketed. Authorized net weight not over 400 pounds. Authorized only for calcium hypochlorite mixtures, dry.

(6) Specification 56 (§§ 178.251, 178.252 of this subchapter). Metal portable tank. Authorized only for mono-(trichloro) tetra - (monopotassium dichloro)-penta-s-triazinetriene, dry, potassium dichloro-s-triazinetriene, dry, and sodium dichloro-s-triazinetriene, dry.

(b) Limited quantities of these materials in strong outside wooden or fiberboard packages with inside packagings of glass not over five pounds capacity each, or with inside metal packagings or plastic bottles not over ten pounds capacity each, are excepted from labeling and the specification packaging requirements of this subchapter. In addition, shipments are not subject to Part 172 or Part 177 of this subchapter.

§ 173.218 Isopropyl percarbonate, unstabilized.

(a) Isopropyl percarbonate, unstabilized, must be packed in specification containers as follows:

(1) Spec. 15A, 15B, 15C, 16A, or 19A (§ 178.168, § 178.169, § 178.170, § 178.185 or § 178.190 of this subchapter). Wooden boxes, or other equally efficient container when approved by the Bureau of Explosives, with glass, metal, or earthenware inside containers of not over 2 gallons capacity each which must be maintained at a temperature below 0° F. Shipments are authorized for transportation by private or contract carrier by motor vehicle only.

§ 173.219 Potassium perchlorate.

(a) Potassium perchlorate must be packed as follows:

(1) As prescribed in § 173.154 (a) (1) to (11).

§ 173.220 Magnesium or zirconium scrap consisting of borings, clippings, shavings, sheets, turnings, or scalplings, and magnesium metallic (other than scrap), powdered, pellets, turnings, or ribbon.

(a) Magnesium or zirconium scrap consisting of borings, shavings, or turnings, must be packed in closed metal barrels or drums, wooden barrels, metal pails, fiber drums, or four-ply paper bags. Paper bags are not authorized for less-than-truckload shipments.

(1) Magnesium or zirconium scrap consisting of clippings, scalplings, or scrap sheets may be shipped in bulk in truckload quantities. Trucks or trailers must have closed or completely covered bodies.

(2) Limited quantities of magnesium or zirconium scrap consisting of clippings, scalplings, or scrap sheets in closed metal drums, wooden barrels, or wooden boxes, unless otherwise provided is excepted from labeling and specification packaging requirements of this subchapter. In addition, shipments are not subject to Part 172 or Part 177 of this subchapter.

(b) Magnesium metallic (other than scrap), powdered, pellets, turnings, or ribbon must be packed in containers as prescribed in § 173.154.

(1) Limited quantities of magnesium metallic (other than scrap), pellets, turnings, or ribbon in fiberboard boxes with inside glass bottles not over 1 pound capacity each, with not more than 25 pounds net weight of product in each outside fiberboard box, in closed metal drums, metal pails, fiber drums, or wooden boxes with inside packagings are, unless otherwise provided excepted from labeling and the specification packaging requirements of this subchapter. In addition, shipments are not subject to Part 172 or Part 177 of this subchapter.

§ 173.221 Liquid organic peroxides, n.o.s., and liquid organic peroxide solutions, n.o.s.

(a) Liquid organic peroxides, n.o.s., and liquid organic peroxide solutions, n.o.s. must be packed in packagings which may be equipped with venting devices wherever necessary to prevent excessive pressure buildup, as follows:

(1) Spec. 1A or 1D (§§ 178.1 or 178.4 of this subchapter). Carboys, glass, boxed, capacity not over 5 gallons for spec. 1A (§ 178.1 of this subchapter), and 6.5 gallons for spec. 1D (§ 178.4 of this subchapter).

(2) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 178.168, 178.169, 178.170, 178.185, or 178.190 of this subchapter). Wooden boxes with inside containers which must be glass, earthenware, or metal, not over 1 gallon each, cushioned with incombustible packing material in sufficient quantity to absorb the contents of the inner container. Metal inside containers authorized only for materials which will not react dangerously with or be decomposed by contact with metal.

(3) Specification 12B (§ 178.205 of this subchapter). Fiberboard box with Specification 2E (§ 178.24a of this subchapter) inside polyethylene bottles, or with glass or metal inside receptacles, not over 1 gallon each. Not more than six 1-gallon polyethylene bottles may be packed in one fiberboard box. Not more than one 1-gallon glass or metal inside receptacle, which must be cushioned with noncombustible packing material in sufficient quantity to absorb the contents of the inner receptacle, may be packed in one fiberboard box. Metal and polyethylene inside receptacles authorized only for material which will not react dangerously with or be decomposed by contact with metal or polyethylene.

(4) Spec. 42B (§ 178.107 of this subchapter). Aluminum drums not over 15 gallons capacity. Authorized only for peroxides which will not react dangerously with the aluminum or be decomposed by contact with it.

(5) Spec. 17C or 17E (§§ 178.115 or 178.116 of this subchapter). Metal drums

(single-trip) not over 15 gallons capacity. Authorized only for material which will not react dangerously with the drum metal, or be decomposed by contact with it.

(6) Spec. 22C (§ 178.198 of this subchapter). Plywood drum as prescribed by § 178.198-2(a) of this subchapter, with inside spec. 2T (§ 178.21 of this subchapter) polyethylene container. Authorized only for material which will not react dangerously with or cause decomposition of the polyethylene.

(7) Spec. 6D or 37M (nonreusable container) (§ 178.102 or 178.134 of this subchapter). Cylindrical steel overpacks with inside spec. 2S (§ 178.35 of this subchapter) polyethylene container. Authorized only for material which will not react dangerously with or cause decomposition of the polyethylene.

(8) Spec. 37P (§ 178.133 of this subchapter). Steel drums, not over 5-gallons capacity, with one-piece seamless molded polyethylene liner (nonreusable container). Drums exceeding 1-gallon capacity must be constructed of at least 24-gauge metal. Authorized only for materials that will not react with polyethylene and result in container failure.

(9) Spec. 12P (§ 178.211 of this subchapter). Fiberboard boxes with inside spec. 2U (§ 178.24 of this subchapter) polyethylene containers not over 5 gallons capacity each. Wire staples are not authorized for assembly or closure of boxes, except when polyethylene container is completely enclosed in inside boxes free of wire staples or other projections that could cause failures.

(10) Spec. 12B (§ 178.205 of this subchapter). Fiberboard boxes with inside polyethylene bottles, not over 5-gallons capacity each, as specified by § 178.205-34 of this subchapter. Not more than one bottle shall be packed in one outside box. Authorized only for material which will not react dangerously with or cause decomposition of polyethylene.

(11) Specification 16A (§ 178.185 of this subchapter). Wooden boxes with inside Specification 2U, 2S, or 2SL (§§ 178.24, 178.35, 178.35a of this subchapter) polyethylene containers, not over 5-gallon capacity each. Specification 2U container must have a minimum wall thickness of 0.015 inch. The polyethylene container must be separated from the wooden box by a complete corrugated fiberboard liner, top pad, and bottom pad. Authorized only for materials which

will not react dangerously with or be decomposed by contact with polyethylene.

not react dangerously with or cause decomposition of polyethylene.

§ 173.222 Acetyl peroxide and acetyl benzoyl peroxide, solution.

(a) Acetyl peroxide must be shipped in solution in a non-volatile solvent and must contain not more than 25 percent by weight of the peroxide. Acetyl benzoyl peroxide must be shipped in solution in a non-volatile solvent and must contain not more than 40 percent by weight of the peroxide. They must be packed in specification containers as follows:

(1) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 178.168, 178.169, 178.170, 178.185, or 178.190 of this subchapter). Wooden boxes with inside containers which must be glass or earthenware, not over 1 gallon each, cushioned with incombustible packing material in sufficient quantity to absorb the contents of the inner container.

(2) Spec. 1A or 1D (§§ 178.1 or 178.4 of this subchapter). Carboys, glass, boxed, capacity not over 5 gallons for spec. 1A (§ 178.1 of this subchapter), and 6.5 gallons for spec. 1D (§ 178.4 of this subchapter).

(3) Spec. 12B (§ 178.205 of this subchapter). Fiberboard boxes with inside containers which must be glass or earthenware, not over 1 gallon each, cushioned with incombustible packing material in sufficient quantity to absorb the contents of the inner container. Not more than one 1-gallon inside container shall be packed in one outside fiberboard box.

(4) Spec. 12P (§ 178.211 of this subchapter). Fiberboard boxes with inside spec. 2U (§ 178.24 of this subchapter) polyethylene containers not over 5 gallons capacity each. Wire staples are not authorized for assembly or closure of boxes, except when polyethylene container is completely enclosed in inside boxes free of wire staples or other projections that could cause failures.

(5) Spec. 12B (§ 178.205 of this subchapter). Fiberboard boxes with inside polyethylene bottles, not over 5 gallons capacity each, as specified by § 178.205-34 of this subchapter. Not more than one bottle shall be packed in one outside box. Authorized only for material which will

§ 173.223 Peracetic acid.

(a) Peracetic acid must be shipped in solution not exceeding 40 percent strength and must be packed in specification containers as follows:

(1) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 178.168, 178.169, 178.170, 178.185, or 178.190 of this subchapter). Wooden boxes with inside containers which must be glass or earthenware, not over one gallon capacity each, cushioned with sterile absorbent cotton or other cushioning material which will not react with the contents to generate heat. Cushioning material must be in sufficient quantity to completely absorb the contents of the inner container.

(2) Spec. 12B (§ 178.205 of this chapter). Fiberboard boxes with inside containers which must be glass or earthenware, not over one quart capacity each, cushioned with sterile absorbent cotton or other cushioning material which will not react with the contents to generate heat. Cushioning material must be in sufficient quantity to completely absorb the contents of the inner container.

(3) Spec. 1D (§ 178.4 of this subchapter). Boxed glass carboy.

(4) Spec. 22C (§ 178.198 of this subchapter). Plywood drum as prescribed by § 178.198-2(a) of this subchapter, with inside spec. 2T (§ 178.21 of this subchapter) polyethylene container.

(5) Spec. 37M (§ 178.134 of this subchapter). Cylindrical steel overpack non-reusable container with inside spec. 2SL (§ 178.35a of this subchapter) polyethylene container not over 30 gallons capacity. Polyethylene container must have a vented closure capable of preventing leakage of liquid contents.

(b) Limited quantities of peracetic acid solutions not exceeding 40 percent strength packed in strong wooden or fiberboard boxes, with not more than one inside glass packaging not exceeding 1 pint capacity, cushioned with sterile absorbent cotton or other cushioning material which will not react with the contents to generate heat, and with such cushioning material in sufficient quantity to completely absorb the contents of the bottle, are excepted from

labeling and the specification packaging requirements of this subchapter. In addition, shipments are not subject to Part 172 or Part 177 of this subchapter.

§ 173.224 Cumene hydroperoxide, dicumyl peroxide, diisopropylbenzene hydroperoxide, paramenthane hydroperoxide, and tertiary butylisopropyl benzene hydroperoxide.

(a) Cumene hydroperoxide of strength not exceeding 96 percent in a non-volatile solvent, dicumyl peroxide of strength not exceeding 50 percent in a non-volatile solvent, diisopropylbenzene hydroperoxide of strength not exceeding 60 percent in a non-volatile solvent, paramenthane hydroperoxide of strength not exceeding 60 percent in a non-volatile solvent, and tertiary butylisopropyl benzene hydroperoxide of strength not exceeding 60 percent must be packed in specification containers as follows:

(1) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 178.168, 178.169, 178.170, 178.185, or 178.190 of this subchapter). Wooden boxes with inside containers which must be glass or earthenware, not over 1 gallon each, cushioned with incombustible packing material in sufficient quantity to absorb the contents of the inner container.

(2) Spec. 17E (§ 178.116 of this subchapter). Metal drums (single trip), with interiors so treated that they will be resistant to the contents.

(3) [Reserved]

(4) Specification MC 310, MC 311 or MC 312 (§ 178.343 of this subchapter). Tank motor vehicles. Authorized for paramenthane hydroperoxide of strength not exceeding 60 percent in a nonvolatile solvent only. Authorized for cumene hydroperoxide of strength not exceeding 90 percent in a nonvolatile solvent in MC 311 or MC 312 cargo tanks only.

§ 173.225 Phosphorus trisulfide; phosphorus sesquisulfide; phosphorus heptasulfide, and phosphorus pentasulfide.

(a) Phosphorus trisulfide, phosphorus sesquisulfide, phosphorus pentasulfide and phosphorus heptasulfide must be packaged as follows:

(1) Spec. 15A or 15D (§§ 178.168 or 178.169 of this subchapter). Wooden boxes with metal inside containers hermetically sealed (soldered) or watertight metal cans with screw-top closures.

Other closures if approved by the Bureau of Explosives will be permitted.

(2) Spec. 6A, 6B, or 6C (§§ 178.97, 178.98, or 178.99 of this subchapter). Metal barrels or drums, not over 30 gallons capacity each.

(3) Spec. 37A or 37B (§ 178.131 or § 178.132 of this subchapter). Metal drums (single-trip). Gross weight not over 425 pounds.

(b) Phosphorus pentasulfide must be packed as follows:

(1) In any packaging prescribed in § 173.154 which will not permit water to come in contact with the lading.

(2) Specification 53 or 56 (§§ 178.251, 178.252 of this subchapter). Metal portable tank.

(3) Metal drum not over 15 gallons capacity. Authorized only for phosphorus pentasulfide fused into a solid mass before transportation.

§ 173.226 Thorium metal, powdered.

NOTE: Thorium metal, a low specific activity radioactive material, is also subject to the applicable provisions of §§ 173.389 through 173.399.

(a) Thorium metal, powdered, must be packed in specification containers as follows:

(1) Spec. 15A or 15B (§§ 178.168 or 178.169 of this subchapter). Wooden boxes with inside metal containers, tightly and securely closed by push-in covers held in place by soldering at least at four points, or in screw-cap type metal cans. Inside containers must not exceed 10 pounds net each. Gross weight of outside packages must not exceed 75 pounds each.

(b) Limited quantities of thorium metal powder packed in tightly and securely closed metal cans, cushioned with incombustible material in strong outside wooden or fiberboard boxes, and not exceeding 4 ounces net weight in one outside packaging, is excepted from labeling and the specification packaging requirements of this subchapter. In addition, shipments are not subject to Part 172 or Part 177 of this subchapter.

§ 173.227 Urea peroxide.

(a) Urea peroxide must be packed in specification containers as follows:

(1) Spec. 12B (§ 178.205 of this subchapter). Fiberboard boxes with inside containers which must be rubber or plastic containers not exceeding 4 ounces

each. Gross weight not over 65 pounds.

(2) Spec. 21C (§ 178.224 of this subchapter). Fiber drums completely coated on the inside with a suitable wax, synthetic coating, or metal foil suitable to the lading; or fiber drums having a metal foil (laminated between two sheets of kraft paper with thermoplastic adhesive) moisture and water barrier wound into the sidewall of the drum and located not more than 2 plies from the interior of drum but not to be wound as the first ply; a metal foil moisture and water barrier must also be present in the fiber or wood heading; exterior of drum sidewall must be protected with a water resistant coating; in addition to the tests prescribed by § 178.224-2 (a), (b), and (c) of this subchapter, a drum having been given a 4-foot diagonal bottom chime drop must, after being emptied, withstand complete immersion of the bottom in 6 inches of water for 4 hours without leakage to the interior. Authorized net weight not over 225 pounds.

(3) Spec. 22A (§ 178.196 of this subchapter). Plywood drums with paper bags, spec. 2J (§ 178.28 of this subchapter) coated with suitable wax on the inner surface.

§ 173.228 Zinc ammonium nitrite.

(a) Zinc ammonium nitrite must be packed in specification containers as follows:

(1) Spec. 6A, 6B, or 6C (§§ 178.97, 178.98, or 178.99 of this subchapter). Metal barrels or drums.

(2) Spec. 17E, 17H, 37A, or 37B (§§ 178.116, 178.118, 178.131, or § 178.132 of this subchapter). Metal drums (single-trip). Gross weight not over 300 pounds.

§ 173.229 Chlorate and borate mixtures or chlorate and magnesium chloride mixtures.

(a) Chlorate and borate mixtures or chlorate and magnesium chloride mixtures containing more than 50 percent chlorate and no other hazardous additives must be packed as follows:

(1) As prescribed in § 173.163.

(b) Limited quantities of chlorate and borate mixtures or chlorate and magnesium chloride mixtures containing no other hazardous additives and containing less than 50 percent chlorate are excepted from labeling and the specification packaging requirements of this subchapter. In addition, shipments are not subject to Part 172 or Part 177 of this subchapter.

(1) Tight metal or fiber drums.

(2) Wooden boxes with tight inside metal containers.

(3) Multi-wall paper bags, net weight not over 50 pounds, moisture proof and sift proof, and having a strength capable of withstanding four 4-foot drops onto solid concrete.

(4) Strong fiberboard boxes with inside fiber containers having metal tops and bottoms, net weight not over 4 pounds each; gross weight of completed package not over 65 pounds.

(5) Strong fiberboard boxes with not more than 4 inside paper bags spec 2D (§ 178.23 of this subchapter), having net weight not over 10 pounds each.

(c) Chlorate and borate mixtures or chlorate and magnesium chloride mixtures containing 28 percent or less chlorate and no other hazardous additives, are not subject to this chapter.

§ 173.230 Sodium, metallic, dispersion in organic solvent.

(a) Sodium, metallic, dispersion in organic solvent must be packed in specification containers as follows.

(1) Spec. 15A (§ 178.168 of this subchapter). Wooden boxes with inside containers which must be metal cans not exceeding one quart capacity, and each such can must be packed in another metal can and cushioned on all sides with at least one inch of incombustible dry nonhygroscopic material which is nonreactive with sodium at temperatures encountered during normal transportation. Both the inner and outer metal cans shall be equipped with an airtight closing device secured by positive means (not friction). Gross weight of completed package must not exceed 100 pounds.

(2) Spec. 17H (§ 178.118 of this subchapter). Metal drum (single-trip) of not over 55 gallons capacity, with material contained in an inside spec. 17E (§ 178.116 of this subchapter) metal drum (single-trip) of not over 30 gallons capacity. The inside drum shall be snugly packed in the outside drum by completely and evenly surrounding it with incombustible dry nonhygroscopic material which is nonreactive with sodium at temperatures encountered during normal transportation.

(3) Spec. 12B (§ 178.205 of this subchapter). Fiberboard boxes constructed of at least 375-pound test (Mullen or Cady) solid fiberboard with inside metal cans not exceeding one quart capacity.

Each such can must be packed in another metal can and cushioned on all sides with at least one inch of incombustible dry nonhygroscopic material which is nonreactive with sodium at temperatures encountered in normal transportation. Both the inner and outer metal cans shall be equipped with an airtight closing device secured by positive means (not friction) and must be individually nested into a double-faced corrugated partition of at least 200-pound test (Mullen or Cady) which is in turn surrounded on all sides by a peripheral double-walled corrugated liner of at least 200-pound test (Mullen or Cady). Authorized gross weight not over 90 pounds.

(4) Spec. 15A (§ 178.168 of this subchapter). Wooden boxes with inside polyethylene bottles not exceeding 1-quart capacity each cushioned on all sides with at least 1-inch soda ash and then placed within an airtight metal can closed by a positive means. Metal cans shall be cushioned so as to prevent movement within the outer box. Solvents used must be compatible with the inner polyethylene bottle. Gross weight of the completed package must not exceed 100 pounds.

§ 173.231 Calcium, metallic, crystalline.

(a) Calcium, metallic, crystalline must be packed in specification containers as follows:

(1) Spec. 15A or 15B (§§ 178.168 or 178.169 of this subchapter). Wooden boxes with airtight inside metal containers not over 1 gallon capacity each.

(2) Spec. 6A, 6B, or 6C (§§ 178.97, 178.98, or 178.99 of this subchapter). Metal barrels or drums, gross weight not over 350 pounds.

(3) Spec. 17C or 17H (§ 178.115 or § 178.118 of this subchapter). Metal drums (single-trip), gross weight not over 350 pounds.

§ 173.232 Aluminum, metallic powder.

(a) Polished aluminum powder which has been treated with oil or waxes for printing or paint purposes is not subject to the requirements of this subchapter.

(b) Limited quantities of metallic aluminum powder, other than the powder described in paragraph (a) of this section in earthenware, glass, metal, or plastic inside packagings of not more than 5 pounds capacity each, in strong outside packaging of not over 25 pounds net weight, is excepted from labeling and the specifica-

tion packaging requirements of this subchapter. In addition, shipments are not subject to Part 172 or Part 177 of this subchapter.

(c) Metallic aluminum powder, other than the powder described in paragraph (a) of this section, when not packed in accordance with paragraph (b) of this section, must be packaged as follows:

(1) Steel barrel or drum, not over 650 net weight.

(2) Wooden box, not over 125 pounds gross weight.

(3) Moisture and sift-proof bag, not over 100 net weight.

(4) Fiber drum, not over 650 net weight.

(5) Fiberboard box, not over 650 net weight.

(6) Portable tanks, not over 6,500 pounds gross weight.

(7) In bulk in cargo tanks.

§ 173.233 Nickel catalyst, finely divided, activated or spent.

(a) Nickel catalyst, finely divided, activated or spent must be wet with not less than 40 percent by weight of water or other equally suitable liquid and must be packed in specification containers as follows.

(1) Spec. 15A or 15B (§§ 178.168 or 178.169 of this subchapter). Wooden boxes with airtight metal inside containers which must have closing device fastened by positive means (not friction); or airtight glass inside containers of not over 1 quart capacity each, securely cushioned in asbestos wool, vermiculite, or equally efficient incombustible cushioning material.

(2) Spec. 12B (§ 178.205 of this subchapter). Fiberboard boxes with airtight metal inside containers which must have closing device fastened by positive means (not friction); or airtight glass inside containers of not over 1 quart capacity each, securely cushioned in asbestos wool, vermiculite, or equally efficient incombustible cushioning material.

(3) Spec. 5, 6A, 6B, or 6C (§§ 178.80, 178.97, 178.98, or 178.99 of this subchapter). Metal barrels or drums not over 55 gallons capacity each.

(4) Spec. 17H, 37A, or 37B (§ 178.118, § 178.131, or § 178.132 of this subchapter). Metal drums (single-trip)

§ 173.234 Sodium nitrite and sodium nitrite mixtures.

(a) Sodium nitrite and sodium nitrate mixtures must be packed in specification containers as follows:

(1) In containers as prescribed in § 173.154.

(2) Spec. 44C (§ 178.237 of this subchapter). Multiwall paper bags constructed of at least 5 thicknesses of heavy duty shipping sack Kraft paper, or equivalent, with a minimum total basis weight of 310 pounds including a polyethylene or other suitable pliable plastic material inner sheet having a minimum basis weight of 10 pounds. All closures must be of such design as to provide a moisture-resistant package when closed for shipment. Net weight not over 100 pounds each. Authorized for truckload shipments only.

(3) Spec. 21C (§ 178.224 of this subchapter). Fiber drums: Authorized net weight not over 400 pounds.

(4) Spec. 37A (§ 178.131 of this subchapter). Metal drums constructed of steel having minimum thickness of 24 gauge. Bolted or lever-lock closure rings authorized provided drums withstand test prescribed by § 178.131-11 of this subchapter. Authorized gross weight not over 425 pounds.

§ 173.235 Ammonium bichromate (ammonium dichromate).

(a) Ammonium bichromate (ammonium dichromate) must be packed in specification containers as follows:

(1) In containers as prescribed in § 173.154.

(2) Spec. 21C (§ 178.224 of this subchapter). Fiber drums. Authorized net weight not over 400 pounds.

§ 173.236 Decaborane.

(a) Decaborane must be packed in specification containers as follows:

(1) Spec. 6A, 6B or 6C (§§ 178.97, 178.98 or § 178.99 of this subchapter). Metal barrels or drums.

(2) Spec. 17C, 17E, 17H, 37A, or 37B (§§ 178.115, 178.116, 178.118, 178.131, or § 178.132 of this subchapter). Metal drums (single-trip).

(3) Spec. 12B (§ 178.205 of this subchapter). Fiberboard boxes with inside containers which must be metal cans; sliding-lid wooden boxes; fiber cans or boxes, spec. 2G (§ 178.26 of this subchapter), not over 5 pounds capacity each; or glass bottles not over 1 pound capacity each. Packages containing glass containers must not weigh over 65 pounds gross.

§ 173.237 Chlorine dioxide hydrate, frozen; chloric acid.

(a) Chlorine dioxide hydrate, frozen, and chloric acid must be packed in specification packaging as follows:

(1) Specification 12B (§ 178.205 of this subchapter). Fiberboard boxes, with inside packages of polyethylene or other suitable material. Fiberboard boxes must be reinforced and insulated and sufficient dry ice must be used to maintain the hydrate or acid in a frozen state during transportation. Shipments are authorized for transportation by private or contract carrier by motor vehicle only.

(2) Containers and means of refrigeration providing equal efficiency, when approved by the Bureau of Explosives, are authorized for shipments by private carrier by motor vehicle.

§ 173.238 Aircraft rocket engines (commercial) and/or aircraft rocket engine igniters (commercial).

(a) Aircraft rocket engines (commercial) and their igniters may be offered for transportation when of a type approved by the Bureau of Explosives to be so described and classed, and when packaged as follows:

(1) Spec. 15A, 15B, 15E or 16A (§ 178.168, 178.169, 178.172 or 178.185 of this subchapter). Wooden boxes. Igniters must be packaged in sealed metal containers approved by the Bureau of Explosives and packed in wooden boxes as specified above when shipped separately from the Aircraft rocket engines.

(2) Aircraft rocket engines (commercial), when approved by the Bureau of Explosives, may be packed in the same outside shipping container with their separately packaged igniters. Igniters must be packed in separate sealed metal containers in strong inside containers.

(3) Aircraft rocket engines (commercial) and/or their igniters, packed in any other manner than specified in subparagraphs (1) and (2) of this paragraph, must be in containers of a type approved by the Bureau of Explosives.

NOTE 1: For purposes of § 173.238, aircraft rocket engines (commercial) are standby aircraft propulsion engines which are for civil aircraft installation only, comprising a metal case containing a solid composite fuel other than one classified as an explosive and containing no explosive material or element.

§ 173.239 Barium azide—50 percent or more water wet.

(a) Barium azide—50 percent or more water wet, must be packed in specification containers as follows:

(1) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 178.168, 178.169, 178.170, 178.185, or 178.190 of this subchapter). Wooden boxes with inside glass bottles not over one pound capacity each. Bottles shall have rubber stoppers wire tied for securement. If shipment is to take place at a time freezing weather is to be anticipated, a suitable antifreeze solution must be used to prevent freezing.

§ 173.239a Ammonium perchlorate.

(a) Ammonium perchlorate must be packed in specification containers as follows:

(1) In containers as prescribed in § 173.154.

(2) Specification 53* or 56 (§ 178.251, 178.252 of this subchapter). Metal portable tank. Lower side or hopper-type product discharge openings are not permitted.

**Subpart F—Corrosive Materials:
Definition and Preparation**

§ 173.240 Corrosive material; definition.

(a) For the purpose of this subchapter, a corrosive material is a liquid or solid that causes visible destruction or irreversible alterations in human skin tissue at the site of contact, or in the case of leakage from its packaging, a liquid that has a severe corrosion rate on steel.

(1) A material is considered to be destructive or to cause irreversible alteration in human skin tissue if when tested on the intact skin of the albino rabbit by the technique described in Appendix A to this Part, the structure of the tissue at the site of contact is destroyed or changed irreversibly after an exposure period of 4 hours or less.

(2) A liquid is considered to have a severe corrosion rate if its corrosion rate exceeds 0.250 inch per year (IPY) on steel (SAE 1020) at a test temperature of 130° F. An acceptable test is described in NACE Standard TM-01-69.

(b) If human experience or other data indicate that the hazard of a material is greater or less than indicated by the results of the tests specified in paragraph

*Use of existing tanks authorized. Construction not authorized after May 31, 1972.

(a) of this section, the Department may revise its classification or make the material subject to the requirements of this subchapter.

§ 173.241 Outage.

(a) The outage (ullage) for packagings containing corrosive liquids, when offered for transportation, must be in accordance with the following requirements:

(1) General outage requirements. Packagings must not be completely filled. The proper vacant space (outage) in a shipping container depends on the coefficient of expansion of the liquid and the maximum increase of temperature to which it will be subjected in transit. Outage must be calculated to the total capacity of the container.

(2) Outage requirements for packagings of 110 gallons or less. Sufficient outage must be provided so that the packaging will not be liquid full at 130° F. (55° C.).

(3) [Reserved]

(4) Outage requirements for cargo tanks or portable tanks. No cargo tank or portable tank, or compartment thereof, used for the transportation of any corrosive liquid shall be completely filled. The outage for cargo tanks and portable tanks must be no less than 2 percent.

§ 173.242 Bottles containing corrosive liquids.

(a) Bottles containing corrosive liquids, as defined by § 173.240, may not be packed in the same outside container with any other hazardous material, except as specifically provided in paragraphs (b) and (c) of this section and §§ 173.25, 173.257, 173.258, 173.259, 173.260, 173.261, or 173.286.

(b) Bottles containing corrosive liquids cushioned by noncombustible, nonreactive absorbent material and securely packed in tightly closed metal containers, except hydrofluoric acid which must be packed in a container other than a metal container, may be packed with other hazardous material. This exception does not apply to nitric acid exceeding 40 percent concentration, perchloric acid, hydrogen peroxide exceeding 52 percent strength by weight, nitrohydrochloric acid, or nitrohydrochloric acid diluted, which must not be packed in the same outside container with any other article under any circumstances.

(c) Corrosive liquid solutions in securely closed bottles, in quantities necessary for preparing photographic processing mixtures and efficiently cushioned, may be packed in the same outside shipping container with required amounts of packaged dry chemicals not classed as hazardous materials by these regulations, provided no dangerous reaction would occur should the contents of bottles be mixed with the dry chemicals. Marking prescribed in Part 172 of this subchapter is not required.

§ 173.243 Closing and cushioning.

(a) All containers must be tightly and securely closed. Inside containers must be cushioned as prescribed or in any case when necessary to prevent breakage or leakage.

§ 173.244 Limited quantities of corrosive materials.

(a) Limited quantities of corrosive materials for which exceptions are permitted as noted by reference to this section in § 172.101 of this subchapter are excepted from labeling and specification packaging requirements when packed according to the following paragraphs. In addition, shipments are not subject to Part 172 or Part 177 of this subchapter.

(1) Corrosive liquids in bottles having a rated capacity not over 16 ounces by volume each enclosed in a metal can packed in strong outside packaging.

(2) Corrosive liquids in metal or plastic containers having a rated capacity not over 16 ounces by volume in strong outside packaging.

(3) Corrosive solids in earthenware, glass, plastic, or paper containers of not more than 5 pounds capacity each packed in metal, wooden or fiberboard outside packaging not exceeding 25 pounds net weight each.

(4) Corrosive solids in metal, rigid fiber or composition cans or cartons or rigid plastic containers; of not more than 10 pounds capacity each, overpacked in metal, wooden or fiberboard outside containers not exceeding 25 pounds net weight each.

(b) Special exceptions for shipment of certain corrosive materials in the

ORM-D class are provided in Subpart N of this Part.

§ 173.245 Corrosive liquids not specifically provided for.

(a) Corrosive liquids, as defined in § 173.240, other than those for which special requirements are prescribed, must be packed in specification containers constructed of materials that will not react dangerously with or be decomposed by the chemical packed therein, as follows:

(1) Specification 1A, 1B, 1C, or 1E (§§ 178.1, 178.2, 178.3, 178.7 of this subchapter). Glass carboys in boxes, kegs, or plywood drums.

(2) Spec. 1X (§ 178.5 of this subchapter). Boxed carboys; single-trip for export only. For shipment by common carriers by water to noncontiguous territories or possessions of the United States and foreign countries; shipments from inland points in the United States which are consigned to such destinations are authorized to be transported to ship side in truckload lots only.

(3) Specification 1D (§ 178.4 of this subchapter). Boxed glass carboys of not over 6.5 gallons nominal capacity which must be closed, and when reused must be reconditioned and tested, as provided in the specification; means must be provided so that accumulated pressure in bottles may not exceed 10 pounds per square inch gauge at 130°F (55°C), or will vent at a pressure not to exceed 10 pounds per square inch gauge.

(4) Specification 5A, 5B, 5C, or 5M (§§ 178.81, 178.82, 178.83, 178.90 of this subchapter). Metal barrels or drums.

(5) [Reserved]

(6) [Reserved]

(7) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 178.168, 178.169, 178.170, 178.185, or 178.190 of this subchapter). Wooden boxes with inside containers which must be glass, earthenware, polyethylene or other nonfragile plastic material (bags are not authorized); not over 1 gallon each, except that inside containers up to 3 gallons are authorized when only one is packed in each outside container.

(8) Spec. 28 (§ 178.8 of this subchapter). Metal-jacketed lead carboys.

(9) Spec. 5D (§ 178.84 of this subchapter). Rubber lined metal barrels or drums. Any barrel or drum that shows evidence of damage must be tested before shipment for defects in lining in the manner prescribed in § 178.84-15(a) of this subchapter.

(10) Spec. 5H (§ 178.87 of this subchapter). Lead-lined metal barrels or drums.

(11) Spec. 43A (§ 178.18 of this subchapter). Rubber drums.

(12) Spec. 12B (§ 178.205 of this subchapter). Fiberboard boxes with inside containers of polyethylene, or other non-fragile plastic material resistant to the lading, and having threaded closures or other equally efficient type closure, not over 1 gallon capacity each, suitably cushioned to prevent movement within the box. Gross weight of complete package must not exceed 65 pounds.

(13) Spec. 15P or 22C (§ 178.182 or 178.198 of this subchapter). Glued plywood or wooden box, or plywood drum as prescribed by § 178.198-2(a) of this subchapter, with spec. 2T (§ 178.21 of this subchapter) polyethylene container.

(14) Spec. 17C, 17E, or 17F (§§ 178.115, 178.116, or 178.117 of this subchapter). Metal drums (single-trip) with openings not exceeding 2.3 inches in diameter.

(15) Spec. 17H (§ 178.118 of this subchapter). Metal drums (single-trip). Authorized for viscous cleaning compounds, liquid, only.

(16) Specification 6D or 37M (non-reusable container) (§§ 178.102, 178.134 of this subchapter). Cylindrical steel overpacks with inside spec. 2S, 2SL, or 2U (§§ 178.35, 178.35a 178.24 of this subchapter) polyethylene packaging.

(17) Specification 17H, 37A, or 37B (§§ 178.118, 178.131, or 178.132 of this subchapter). Metal drums (single-trip), with welded side seams, not over 5 gallons capacity each. Drums must be lined throughout with a pliable plastic material impervious to the lading. Specification 37A and 37B metal drums must be at least 24 gauge steel.

(18) Spec. 12A (§ 178.210 of this subchapter). Fiberboard boxes with inside glass, polyethylene, or other non-fragile plastic bottles not over 1-gallon capacity each. Not more than 4 inside glass bottles exceeding 5 pints capacity each shall be packed in the outside container. Shipper must have established that the

completed package meets test requirements prescribed by § 178.210-10 of this subchapter.

(19) Specification 37P (§ 178.133 of this subchapter). Steel drum with polyethylene liner (non-reusable container). Authorized only for materials that will not react with polyethylene and result in container failure.

(20) Specification 16D (§ 178.187 of this subchapter). Wirebound wooden overwrap, with inside specification 2T, 2TL, 2S, or 2SL (§§ 178.21, 178.27, 178.35, 178.35a of this subchapter) polyethylene container.

(21) Specification 12P (§ 178.211 of this subchapter). Fiberboard boxes with inside specification 2U (§ 178.24 of this subchapter) polyethylene containers not over 5 gallons capacity each. Wire staples are not authorized for assembly or closure of boxes, except when polyethylene container is completely enclosed in inside boxes free of wire staples or other projections that could cause failures.

(22) Specification 16A (§ 178.185 of this subchapter). Wirebound wooden box (§ 178.185-22 of this subchapter) with inside specification 2U (§ 178.24 of this subchapter) polyethylene container. The polyethylene container must be separated from the wooden box by a complete corrugated fiberboard liner and top and bottom pads.

(23) Spec. 12B (§ 178.205 of this subchapter). Fiberboard boxes with inside polyethylene bottles, not over 5 gallons capacity each, as specified by § 178.205-34 of this subchapter. Not more than one bottle shall be packed in one outside box.

(24) Spec. 21P (§ 178.225 of this subchapter). Fiber drum overpack with inside spec. 2S, 2SL, or 2U (§§ 178.35, 178.35a, or 178.24 of this subchapter) polyethylene container.

(25) Spec. 12A or 12B (§§ 178.210 or 178.205 of this subchapter). Fiberboard boxes with inside aluminum containers not over 5 pounds capacity each. Aluminum containers must be approved by the Bureau of Explosives.

(26) Spec. 34 (§ 178.19 of this subchapter). Polyethylene container without overpack, not over 30-gallons capacity.

(27) Specification 33A (§ 178.150 of this subchapter). Polystyrene case (non-reusable container) having one inside

glass bottle of not over 16 ounces capacity.

(28) Cylinders as prescribed for any compressed gas, except acetylene. All cylinder valves must be protected by one of the methods described in § 173.301 (g) (1), (2), or (3). See § 173.34(e) (16).

(29) Specification MC 303 or MC 304. Tank motor vehicle meeting § 178.343-2(c) of this subchapter. Specification MC 303 must have tanks fabricated from 12-gauge, Type 316 stainless steel. MC 303 is authorized only for phosphoric acid and solutions thereof.

(30) Specification MC 307 (§§ 178.340, 178.342 of this subchapter). Tank motor vehicle meeting § 178.343-2(c) of this subchapter.

(31) Specification MC 306, MC 310, MC 311, or MC 312 (§§ 178.340, 178.341, 178.343 of this subchapter). Tank motor vehicles. If cargo tank is constructed with bottom outlets, they must meet § 178.343-5 of this subchapter. Specification MC 306 must have tanks fabricated from 12 gauge, Type 316 stainless steel. MC 306 is authorized only for phosphoric acid and solutions thereof.

(32) [Reserved]

(33) [Reserved]

(34) Specification 42B (§ 178.107 of this subchapter). Aluminum drum.

(b) A material classed as a corrosive material that is corrosive only to steel and does not meet the definition of any other hazard class defined in this subchapter, is excepted from the requirements of this subchapter when transported in a portable tank or cargo tank constructed of materials that will not react dangerously with or be degraded by the material being transported.

§ 173.245a Corrosive liquids, n.o.s. shipped in bulk.

(a) Corrosive liquids, n.o.s. which are listed in the following table, may not be shipped in bulk unless they are packaged as follows:

Corrosive liquid	Authorized portable tank ¹
Dichlorobutene and Dichlorobutene mixtures.....	.....
Ethyl chlorothiolformate.....	DOT-51, monel-clad.
Ethyl phosphonothioic dichloride, anhydrous.....	DOT-51.
Ethyl phosphonous dichloride, anhydrous.....	DOT-51.
Ethyl phosphorodichloride.....	.....
Methyl phosphonothioic dichloride, anhydrous.....	DOT-51.
Methyl phosphonous dichloride. ¹	DOT-51.

¹ In an unlined tank, must be loaded and shipped under a blanket of nonflammable, dry, inert gas, adequate to displace any significant amount of air.

²[Reserved]

³ Tank must be equipped with a safety-relief valve set at not less than 100 psig. In addition, the relief valve must comply with § 173.315(i)(1).

(b) Corrosive liquids, n.o.s., except those listed in paragraph (a) of this section, when shipped in bulk, must be packaged as prescribed by § 173.245.

§ 173.245b Corrosive solids not specifically provided for.

(a) Corrosive solids, as defined in § 173.240, other than those for which special requirements are prescribed, must be packaged in containers fully complying with § 173.24, as follows:

(1) Metal, wooden, or fiberboard box or case with inside containers which must be earthenware, glass, metal, plastic, or fiber or composition board of not more than 10 pounds net weight capacity each.

(2) Fiberboard box with inside paper bags, not over 50 pounds total net capacity.

(3) Fiberboard box with one inside plastic bag of not over 120 pounds net weight capacity.

(4) Metal drum.

(5) Fiber drum not exceeding 550 pounds net weight and not over 55-gallon capacity.

(6) Plastic drum or pail not exceeding 80 pounds net weight and not over 6-gallon capacity.

(7) Bag: Each bag filled to weight with product and closed as for shipment must

be capable of withstanding four drops from a height of 4 feet onto a solid surface, one drop on each end and one drop on each face, without sifting or rupture. Authorized net weight not to exceed 110 pounds.

(8) Metal portable tank or closed bin of not over 660-gallon capacity and 7,000 pounds gross weight.

(9) Fiberglass or rubber tank or closed bin of not over 74-cubic-foot capacity.

(10) Metal sift-proof cargo tank or hopper-type or pneumatic bulk vehicle.

§ 173.246 Antimony pentafluoride, bromide pentafluoride, iodine pentafluoride, bromine trifluoride, and chlorine trifluoride.

(a) Antimony pentafluoride must be chemically anhydrous. Materials cited in the heading of this section must be packed in specification packagings as follows:

(1) Specification 3A150, 3AA150, 3B240, 3BN150, 4B240, 4BA240, 4BW240, or 3E1800 (§§ 178.36, 178.37, 178.38, 178.39, 178.50, 178.51, 178.61, 178.42 of this subchapter). Cylinders. Each valve outlet must be sealed by a threaded cap or a threaded plug. Cylinder valves must be protected as specified for corrosive gases in § 173.301(g). No cylinder may be equipped with any safety relief device. Specification 3E1800 cylinders must be packaged in accordance with the requirements of § 173.301(k).

(2) Specification 106A500X or 110A-500W (§§ 179.300, 179.301 of this subchapter). Tanks. Authorized for iodine pentafluoride and chlorine trifluoride only. Each tank must be equipped with a valve protection cover and with solid steel plugs in place of fusible plug safety devices. No tank may be equipped with any safety relief device.

§ 173.247 Acetyl bromide, acetyl chloride, acetyl iodide, antimony pentachloride, benzoyl chloride, boron trifluoride-acetic acid complex, chromyl chloride, dichloroacetyl chloride, diphenylmethyl bromide solution, pyro sulfuryl chloride, silicon chloride, sulfur chloride (mono and di), sulfuryl chloride, thionyl chloride, tin tetrachloride (anhydrous), titanium tetrachloride, and trimethyl acetyl chloride.

(a) Acetyl bromide, acetyl chloride, acetyl iodide, antimony pentachloride, benzoyl chloride, boron trifluoride-acetic acid complex, chromyl chloride, di-

chloroacetyl chloride, diphenylmethyl bromide solutions, pyro sulfuryl chloride, silicon chloride, sulfuryl chloride (mono and di), sulfuryl chloride, thionyl chloride, tin tetrachloride (anhydrous), titanium tetrachloride, and trimethyl acetic chloride must be packaged in specification packagings as follows:

(1) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 178.168, 178.169, 178.170, 178.185, or 178.190 of this subchapter). Wooden boxes with glass or earthenware inside containers not over 1 gallon each, except that inside containers up to 3 gallons each are authorized when only one is packed in an outside container.

(2) Specification 6D (§ 178.102 of this subchapter). Cylindrical steel overpack with inside Specification 2S or 2SL (§§ 178.35, 178.35a of this subchapter) polyethylene packaging. Polyethylene used must be Type III as set forth in Appendix B—Specification for Plastics to Part 178 of this Title. Authorized for acetyl chloride, dichloroacetyl chloride and sulfuryl chloride only.

(3) Specification 1A, 1C, 1D, 1E, or 1K (§§ 178.1, 178.3, 178.4, 178.7, 178.14 of this subchapter). Glass carboys in boxes, kegs or plywood drums (not permitted for antimony pentachloride or tin tetrachloride, anhydrous).

(4) Spec. 1X (§ 178.5 of this subchapter). Boxed carboys; single-trip for export only. For shipment by common carriers by water to noncontiguous territories or possessions of the United States and foreign countries; shipments from inland points in the United States which are consigned to such destinations are authorized to be transported to ship side in truckload lots only (not permitted for antimony pentachloride or tin tetrachloride anhydrous).

(5) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 178.168, 178.169, 178.170, 178.185, or 178.190 of this subchapter). Wooden boxes with aluminum bottles of 99 percent pure aluminum not over 1 gallon capacity each, having aluminum screw caps with gasket resistant to contents. Authorized for chromyl chloride only.

(6) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 178.168, 178.169, 178.170, 178.185, or 178.190 of this subchapter). Wooden boxes having inside containers of securely closed soft-lead tubes having not more than 65 fluid ounces capacity each, which tubes shall be individually packed in securely closed steel tubes, with not more than 3 such steel tubes fastened together as a unit. The inside units shall be sur-

rounded on all sides with incombustible mineral material. Authorized for titanium tetrachloride only.

(7) Specification 5, 5A, 5B, or 17C (§§ 178.80, 178.81, 178.82, 178.115 of this subchapter). Metal barrels or drums with openings not exceeding 2.3 inches in diameter.

(8) Spec. 5K (§ 178.88 of this subchapter). Nickel drums, authorized for acetyl chloride, benzoyl chloride, pyro sulfuryl chloride, sulfuryl chloride, and thionyl chloride only. When shipped in unstabilized condition, the lading must be anhydrous and must be free from impurities such as iron.

(9) Spec. 5C (§ 178.83 of this subchapter). Barrels or drums of type 304 stainless steel not over 30 gallons capacity each. Authorized for chromyl chloride only.

(10) Spec. 42D (§ 178.109 of this subchapter). Aluminum drums not over 30 gallons capacity each. Authorized for chromyl chloride only.

(11) Spec. 60 (§ 178.255 of this subchapter). Portable tanks.

(12) Specification MC 310, MC 311, or MC 312 (§ 178.343 of this subchapter). Tank motor vehicles.

(13) [Reserved]

(14) [Reserved]

(15) Sulfur chloride packed in glass or earthenware bottles or carboys must be cushioned in the outside container by means of incombustible elastic packing material of such nature that a mixture of the liquid and the packing material will not cause fires or heating.

(16) Specification 106A500X or 110A500W (§§ 179.300, 179.301) tanks. Authorized only for antimony pentachloride and titanium tetrachloride (anhydrous). Tanks containing titanium tetrachloride (anhydrous) must not be equipped with safety devices. (See § 177.834(m) of this subchapter for special requirements for highway shipments.)

(17) Specification 4BA240 or 4BW240 (§§ 178.51, 178.61 of this subchapter). Metal cylinder. Authorized only for titanium tetrachloride or tin tetrachloride, anhydrous, without any compressed gas. Safety relief devices are not authorized.

§ 173.247a Vanadium tetrachloride and vanadium oxytrichloride.

(a) Vanadium tetrachloride and vana-

dium oxytrichloride must be packed in specification packagings as follows:

(1) Specifications 4B240, 4BA240 and 4BW240 (§§ 178.50, 178.51, 178.61 of this subchapter). Cylinders.

(2) Specification 51 (§ 178.245 of this subchapter) portable tanks.

(3) Specification MC 310, MC 311, or MC 312 (§§ 178.340, 178.343 of this subchapter). Tank motor vehicles. Authorized only for vanadium oxytrichloride blanketed by an inert non-soluble gas.

§ 173.248 Acid sludge, sludge acid, spent sulfuric acid, or spent mixed acid.

(a) Acid sludge, sludge acid, spent sulfuric acid, or spent mixed acid, resulting from the use of sulfuric acid in various processes, not containing hydrofluoric acid, must be packaged as follows:

(1) Specification 1A, 1D, or 1E (§§ 178.1, 178.4, 178.7 of this subchapter). Carboys in boxes or plywood drums. Authorized only for spent sulfuric acid.

(2) Spec. LX (§ 178.5 of this subchapter) Boxed carboys; single-trip for export only. For shipment by common carriers by water to noncontiguous territories or possessions of the United States and foreign countries; shipments from inland points in the United States which are consigned to such destinations are authorized to be transported to ship side in truckload lots only.

(3) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 178.168, 178.169, 178.170, 178.185 or 178.190 of this subchapter). Wooden boxes with inside containers which must be glass or earthenware, not over 1 gallon each, except that inside containers up to 3 gallons are authorized when only one is packed in each outside container.

(4) [Reserved]

(5) [Reserved]

(6) Specification MC 310, MC 311, or MC 312 (§ 178.343 of this subchapter). Tank motor vehicles.

(7) Spec. 60 (§ 178.255 of this subchapter). Portable tanks.

§ 173.249 Alkaline corrosive liquids, n.o.s.; Alkaline liquids, n.o.s.; Alkaline corrosive battery fluid; Potassium fluoride solution; Potassium hydrogen fluoride solution; Sodium aluminate, liquid; Sodium hydroxide solution; Potassium hydroxide solution; Boiler compound, liquid, solution.

(a) Alkaline corrosive liquids, n.o.s.; Alkaline liquids, n.o.s.; Alkaline corrosive battery fluid; Potassium fluoride solution; Potassium hydrogen fluoride solution; Sodium aluminate, liquid; Sodium hydroxide solution; Potassium hydroxide solution; Boiler compound solution must be packed in specification containers of a design and constructed of materials that will not react dangerously with or be decomposed by the chemical packed therein as follows:

(1) In containers prescribed in § 173.245.

(2) Spec. 15A, 15B, 15C, 16A, or 19A (§ 178.168, 178.169, 178.170, 178.185, or 178.190 of this subchapter). Wooden boxes with glass or earthenware inside containers, not over 2 gallons each, or with metal inside containers, not over 5 gallons each.

(3) Specification 5 (§ 178.80 of this subchapter) metal drums. Openings must not exceed 2.3 inches in diameter.

(4) Spec. 17H (§ 178.118 of this subchapter). Metal drums (single-trip). Authorized only for liquid boiler compounds or liquid water treatment compounds.

(5) [Reserved]

(6) Specification MC 310, MC 311, or MC 312 (§ 178.343 of this subchapter). Tank motor vehicles.

(7) Spec. 60 (§ 178.255 of this subchapter). portable tanks.

(8) Spec. 12B (§ 178.205 of this subchapter). Fiberboard boxes with glass inside containers of not over 16 ounces capacity each.

(9) [Reserved]

(10) Spec. 12B (§ 178.205 of this subchapter). Fiberboard boxes, with not more than one glass inside container not over 1 gallon capacity containing sodium hydroxide solution not over 25 percent strength and packed in a strong fiberboard box. Dry chemicals for photographic development process not classed as dangerous articles, contained in suitable inside packages, may be packed in the same outside box. The marking requirements of § 173.401(c) shall not apply.

(11) Spec. 29 (§ 178.226 of this subchapter). Mailing tubes, with not more than one inside polyethylene bottle not over 1-quart capacity each.

(12) Spec. 1H (§ 178.13 of this subchapter). Metal crate with inside polyethylene container spec. 2T (§ 178.21 of this subchapter).

(b) Alkaline corrosive liquids, n.o.s., alkaline liquids, n.o.s., alkaline corrosive battery fluids, and liquid sodium aluminate, must be packaged as follows:

(1) In packagings as prescribed in paragraphs (a)(8), (10), and (11) of this section and § 173.245(a)(7) and (12).

(2) Spec. 5 or 5A (§ 178.80 or 178.81 of this subchapter). Metal barrels or drums, capacity not exceeding 10 gallons, with openings not exceeding 2.3 inches in diameter.

(c) Limited quantities of alkaline corrosive liquids, n.o.s., alkaline liquids, n.o.s., alkaline corrosive battery fluids, and liquid sodium aluminate in inside packagings of not more than 8 fluid ounces capacity each, packed in strong outside packagings, and cushioned with absorbent material in sufficient quantity to completely absorb liquid contents in the event of breakage, are excepted from labeling and specification packaging requirements of this subchapter. In addition, shipments are not subject to Part 172 or Part 177 of this subchapter.

(d) Special exceptions for shipment of certain alkaline in the ORM-D class are provided in Subpart N of this part.

§ 173.249a Cleaning compound, liquid; Coal tar dye, liquid; Dye intermediate, liquid; Mining reagent, liquid; and Textile treating compound mixture, liquid.

(a) A liquid cleaning compound subject to this section must not contain any corrosive material specifically named in § 172.5(a) of this subchapter, except phosphoric acid, acetic acid, and not over 15 percent sodium or potassium hydroxide.

(b) A liquid dye intermediate is a ring compound, containing amino, hydroxy, sulfonic acid, or quinone group or a combination of these groups, used in the manufacture of dyes, and not otherwise specifically named in § 172.5 of this subchapter.

(c) A liquid textile treating compound mixture is a mixture used to treat woven, knit or otherwise manufactured fabrics. It does not include mixtures used only to treat fibers, filaments, or yarn used in making the fabric.

(d) Liquid coal tar dye, liquid cleaning compound, liquid dye intermediate liquid mining reagent, and liquid textile

treating compound mixture must be packaged as follows:

(1) In specification packagings as prescribed in § 173.245.

(2) In packagings meeting all of the specific requirements prescribed in § 173.245 including packaging type and quantity limitations for inside packagings. The packagings are not required to meet the detailed specification requirements of Part 178 of this subchapter except that size and weight limitations for package types as prescribed in Part 178 may not be exceeded.

(3) Removable (open) head fiber drum lined or coated on the inside with a plastic material, not over 55-gallon capacity.

(4) Removable (open) head metal drum, not over 55-gallon capacity.

(5) Removable (open) head polyethylene drum, not over 6.5-gallon capacity.

§ 173.250 Automobiles, other self-propelled vehicles, engines or other mechanical apparatus.

(a) Automobiles and other self-propelled vehicles equipped with electric storage batteries, wet, and electric storage batteries, wet when included in truck-load shipments of automobile parts or assembled material in accordance with paragraphs (a) (1), (2) and (3) of this section are excepted from any other requirements of this subchapter unless other hazardous materials are being transported on such vehicle. In this case, the regulations covering these other materials apply.

(1) When batteries are removed from automobiles and loaded into motor vehicle therewith, the batteries must be so loaded, blocked, and braced as to prevent movement therein during transit, and the load must be so arranged that loose articles cannot come into contact with the batteries.

(2) When wet batteries or batteries shipped dry in the same container with electrolyte (acid) are shipped with automobile parts or assembly material, the batteries must be boxed or crated and so loaded, blocked, and braced in the motor vehicle as to prevent movement therein during transit, and the load must be so arranged that loose articles cannot come in contact with the batteries.

(3) When batteries are installed in the vehicle, they must be completely protected so that short circuits will be prevented and so secured that leakage of acid will not occur under conditions normal to transportation.

(b) Engines or mechanical apparatus of such size or weight as to require securement to skids to facilitate handling may have electric storage batteries, wet, necessary for the operation thereof, either securely fastened in the holder provided on the equipment and protected, including battery terminals, in such manner as to prevent damage thereto or short circuits, or completely boxed in containers of sound lumber and with filling holes upright, securely fastened to the skids upon which the engine or mechanical apparatus is mounted to prevent accidental tipping or looseness in transportation. Electric storage batteries, wet, as described herein are exempt from specification packaging.

§ 173.250a Benzene phosphorus dichloride and benzene phosphorus thiodichloride.

(a) Benzene phosphorus dichloride and benzene phosphorus thiodichloride must be packaged as follows:

(1) In packagings prescribed in § 173.245 which are made of or lined with materials compatible with the lading.

(2) Spec. MC 310, MC 311, or MC 312 (§ 178.343) cargo tanks. Corrosion protection must be provided in accordance with spec. MC 312.

§ 173.251 Boron trichloride and boron tribromide.

(a) Boron trichloride must be packed in specification containers as follows:

(1) Cylinders as prescribed for any compressed gas, except acetylene.

(2) Specification 106A500X (§§ 179.300, 179.301 of this subchapter). Tank car tanks.

(b) Boron tribromide must be packed in specification packagings as follows:

(1) Specification 15A, 15B, or 15P (§§ 178.168, 178.169, 178.182 of this subchapter). Wooden or plywood boxes with inside glass receptacles not over 1 quart capacity each. Each glass receptacle must have a positive closure (not friction) and

as prepared for shipment must be capable of withstanding an internal gage pressure of at least 15 p.s.i. The receptacle must be cushioned with sufficient absorbent incombustible material to completely absorb the contents in the event of leakage and must be packed within a securely closed metal can. Each can must then be cushioned with incombustible material within the prescribed outside packaging. Completed packaging for shipment must be capable of passing the tests prescribed in § 178.182-3(a)(1) of this subchapter.

(2) Specification 5C or 5M (§§ 178.83, 178.90 of this subchapter). Metal drums not exceeding 30 gallons capacity. Specification 5C drums must be constructed of at least 14-gage stainless steel.

§ 173.252 Bromine.

(a) Bromine must be packed in specification containers as follows:

(1) Spec. 15A or 15B (§§ 178.168 or 178.169 of this subchapter). Wooden boxes with glass inside containers not over 1 quart each; or with stone or earthenware jugs not over 1 gallon each.

(2) Spec. 5H (§ 178.87 of this subchapter). Lead-lined metal barrels or drums not over 10 gallons each.

(3) [Reserved]

(4) Specification MC 310 or MC 312 (§ 178.343 of this subchapter). Tank motor vehicles. Each tank must have a shell and head thickness of at least three-eighths inch. Each tank must have a nickel cladding material on the inside surface comprising at least 20 percent of the total thickness or be lined with lead at least $\frac{3}{16}$ -inch thick. The cladding material must conform to requirements of ASTM Specification B-162-69. The composite plate must conform to requirements of ASTM Specification A-265-69. The maximum quantity of liquid bromine loaded into the tank must not exceed 300 percent of the water weight capacity of the tank. The total quantity loaded must not be less than 98 percent of the quantity the tank is authorized to carry.

(b) Outage (vacant space above liquid) for inside containers must be not less than 15 percent of capacity of container.

(c) For other authorized containers an outage of not less than 10 percent is required.

(d) Inside containers must be closed by glass, earthenware, or stone stoppers ground to fit and securely fastened; or bottles may have necks with molded screw threads which must be closed by threaded-type caps with lead or other efficient bromine-resistant gaskets and cushioned by elastic material to insure tight closure. Sealed glass ampoules are also authorized.

(e) Except as provided in paragraphs (g) (2) and (3) of this section, bottles or jugs must be securely cushioned on all sides with incombustible packaging material, such as whiting, mineral wool, infusorial earth (keiselguhr), sifted ashes, powdered china clay, or similar material, at least 1 inch thick, which will not produce heat when mixed with bromine. The use of hay, sawdust, excelsior, or other organic material, either treated or untreated, as a cushioning or packaging material is prohibited.

(f) Not more than 15 quarts of bromine in bottles, nor more than 12 quarts in jugs, may be packed in one box.

(g) Bromine which has been dried in accordance with good commercial practice may also be packed in specification containers as follows:

(1) Specification 5K or 5M (§§ 178.88, 178.90 of this subchapter). Specification 5K nickel drums of not over 10 gallons capacity each and containing not more than 225 pounds net weight of bromine or Specification 5M monel drums of not over 25 gallons capacity each and containing not more than 600 pounds net weight of bromine. Drums must be of metal at least 14-gage United States standard throughout and must have chime reinforcement adequate for their protection. All openings must be in one head and closing parts (plug, cap, flange, etc.) must be of the same metal as the drum. One opening not over 2.3 inch diameter and one opening not over $\frac{3}{4}$ -inch standard pipe size are permitted. Each drum must be completely emptied and dried before reuse and must be equipped with gaskets of a material approved by the Bureau of Explosives.

(2) Specification 12A (§ 178.210 of this subchapter). Fiberboard boxes, constructed of at least 275 pound test (Mullen or Cady) double-wall corrugated fiberboard having not more than six inside glass bottles of not over 1 quart capacity. Each inside glass bottle must be surrounded by a sheet of polyethylene

foam at least 7/16 inch thick (see Note 1), and approximately the same height as the bottle, and must also be separated by partitions made of corrugated fiberboard at least 275-pound test (Mullen or Cady). The box must be provided with inside top and bottom pads of polyethylene foam at least 1 1/8 inches thick (see Note 1). Shipper must have established that the completed package closed as for shipment, with inside packagings filled with liquid of same specific gravity as bromine, is capable of withstanding tests prescribed by § 178.210-10 of this subchapter.

NOTE 1: Other materials of equal efficiency and compatibility are also authorized.

(3) Specification 12A (§ 178.210 of this subchapter). Fiberboard box with inside glass bottles having a capacity not exceeding one quart with closures meeting the requirements of paragraph (d) of this section. Each bottle must be enclosed in a tinplate slipcover metal can surrounded by non-combustible cushioning material. Each box may not contain more than four bottles with each having a capacity not exceeding 1 quart or 12 bottles with each having a capacity not exceeding 8 fluid ounces. The shipper must have established that the completed package closed for shipment, with inside bottles filled with a liquid of the same specific gravity and similar viscosity as bromine, is capable of withstanding the tests prescribed in § 178.210-10 of this subchapter.

§ 173.253 Chloroacetyl chloride.

(a) Chloroacetyl chloride must be packed in specification containers as follows:

(1) Spec. 15A or 15B (§§ 178.168 or 178.169 of this subchapter). Wooden boxes, with inside glass containers not over 5 pints capacity each, cushioned with incombustible material.

(2) Spec. 28 (§ 178.8 of this subchapter). Metal-jacketed lead carboys.

(3) Spec. 5H (§ 178.87 of this subchapter). Lead-lined metal barrels or drums.

(4) [Reserved]

(5) Spec. 5K (§ 178.88 of this subchapter). Nickel drums.

(6) Specification MC 310, MC 311, or MC 312 (§ 178.343 of this subchapter). Tank motor vehicles having tanks fabricated from Type 316 stainless steel.

§ 173.254 Chlorosulfonic acid and mixtures of chlorosulfonic acid-sulfur trioxide.

(a) Chlorosulfonic acid and mixtures of chlorosulfonic acid-sulfur trioxide must be packed in specification containers as follows:

(1) Spec. 5A or 5C (§§ 178.81 or 178.83 of this subchapter). Metal barrels or drums.

(2) Spec. 15A, 15B, 15C, 16A, or 16A (§§ 178.168, 178.169, 178.170, 178.185, or 178.190 of this subchapter). Wooden boxes, with inside containers which must be glass or earthenware, not over 1 gallon each, except that inside containers up to 3 gallons are authorized when only one is packed in each outside container.

(3) [Reserved]

(4) [Reserved]

(5) Specification MC 310, MC 311, or MC 312 (§ 178.343 of this subchapter). Tank motor vehicles.

§ 173.255 Dimethyl sulfate.

(a) Dimethyl sulfate must be packed in specification containers as follows:

(1) Spec. 5A or 5C (§§ 178.81 or 178.83 of this subchapter). Metal barrels or drums not over 55 gallons each. Spec. 5C metal barrels or drums must be constructed of Type 304 stainless steel.

(2) Spec. 5 (§ 178.80 of this subchapter). Metal barrels or drums not over 15 gallons each, with openings not exceeding 2.3 inches in diameter, inclosed in strong crates made of lumber at least 5/8 inch thick.

(3) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 178.168, § 178.169, § 178.170, § 178.185, or § 178.190 of this subchapter). Wooden boxes with each box containing a single glass inside container not over 1 quart capacity, closed by ground glass stopper or other equally efficient closure securely fastened in place, and cushioned with incombustible absorbent material in hermetically sealed (soldered) metal can the can then being cushioned with incombustible cushioning material in the outside container.

(4) [Reserved]

(5) Specification MC 310, MC 311, or MC 312 (§ 178.343 of this subchapter). Tank motor vehicles.

(6) Spec. 12B (§ 178.205 of this subchapter). Fiberboard boxes with each box containing not more than six inside glass containers not over 1-quart capacity

each, closed by plastic screw-cap resistant to the lading, and each completely surrounded by incombustible absorbent cushioning material and enclosed in a metal can having rolled, seamed-on heads of a key-opening type; or in not more than six inside glass containers not over 1-quart capacity each, closed by ground glass stopper, by plastic screw-cap resistant to the lading, or by other equally efficient closure securely fastened in place, and cushioned with incombustible absorbent material in hermetically sealed (soldered) metal can, the can then being cushioned with incombustible cushioning material in the outside container.

§ 173.256 Compounds, cleaning, liquid.

(a) Compounds, cleaning, liquid, containing not more than 60 percent hydrofluoric acid, must be packed in specification containers as follows:

(1) As prescribed in § 173.264 (a) (1) and (2).

(2) Spec. 12B (§ 178.205 of this subchapter). Fiberboard boxes with inside containers of natural rubber, ceresine, lead, or other material of equal strength and not subject to destruction by the lading.

(3) Spec. 22B (§ 178.197 of this subchapter). Plywood drums equipped with molded liner of type and material approved by the Bureau of Explosives

(4) Specification 16A (§ 178.185 of this subchapter). Wirebound wooden box (§ 178.185-22 of this subchapter) with inside specification 2U (§ 178.24 of this subchapter) polyethylene container. The polyethylene container must be separated from the wooden box by a complete corrugated fiberboard liner and top and bottom pads.

(5) Spec. 6D or 21P (§ 178.102 or §§ 178.225 of this subchapter). Cylindrical steel overpack or fiber drum overpack with inside spec. 2U (§ 178.24 of this subchapter) polyethylene container not over 15-gallons capacity.

§ 173.257 Electrolyte (acid) and alkaline corrosive battery fluid.

(a) Electrolyte (acid) may not be over 47 percent strength (39° Baume). Electrolyte or alkaline corrosive battery fluid must be packaged as follows:

(1) As prescribed in § 173.272 except that unlined metal barrels or drums must not be used.

(2) Spec. 43A (§ 178.18 of this subchapter). Rubber drums.

(3) When the material is alkaline it may also be shipped when packed in containers as prescribed in § 173.249.

(4) Specification MC 310, MC 311, or MC 312 (§ 178.343 of this subchapter). Tank motor vehicles, except that unlined tanks must not be used.

(5) Spec. 60 (§ 178.255 of this subchapter). Portable tanks, except that unlined tanks must not be used.

(6) Spec. 12B or 12C (§ 178.205 or § 178.206 of this subchapter). Fiberboard boxes with inside containers of polyethylene or other electrolyte acid resistant nonfragile materials having secure closures capable of withstanding conditions incident to transportation without leakage and unless containers are rigid or semi-rigid in nature they must be contained in other strong inside containers; minimum thickness of polyethylene or other materials shall be not less than 0.003 inch for any film sheet for multi-wall containers or not less than 0.006 inch for single-wall containers; not more than 12 such inside containers shall be packed in one outside box and the marking prescribed in § 173.401(c) shall not be required. Inside containers shall be packed to prevent movement within the box (see §§ 178.205-34 and 178.206-19 of this subchapter). Dry storage batteries or battery charger device may be packed in the same outside box when adequately separated from other inside containers (see § 178.205-33 of this subchapter); gross weight of completed package shall not exceed 65 pounds, except when acid is packed in individual inside containers the gross weight shall be not over 75 pounds. Complete package, closed as for shipment, with inside containers filled with liquid of same specific gravity as commodity to be shipped, must be capable of withstanding at least 2 drops from a height of 4 feet onto solid concrete without leakage from or rupture of inside containers.

(7) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 178.168, 178.169, 178.170, 178.185, or 178.190 of this subchapter). Wooden boxes with inside containers of polyethylene, or other electrolyte acid resistant plastic, not over 1 gallon each.

(8) Specification 1EX (§ 178.6 of this subchapter). Carboys in plywood drums.

(9) Spec. 12B (§ 178.205 of this subchapter). Fiberboard boxes constructed

of at least 275-pound test (Mullen or Cady) double-wall corrugated fiberboard or 325-pound test (Mullen or Cady) double-faced corrugated fiberboard, with not more than 12 inside glass bottles, having acid-proof closures, of not over 32 ounces capacity each. Inside glass bottles must be separated and cushioned by suitable corrugated fiberboard partitions. The box must be equipped with top and bottom pads. (See § 178.205-32 of this subchapter.)

(10) Spec. 12B (§ 178.205 of this subchapter). Fiberboard boxes having not more than 1 inside glass bottle, with acid-proof closure, not over 1 gallon capacity. Box shall be constructed of at least 350-pound test (Mullen or Cady) double-faced corrugated fiberboard of full depth telescope type. Cushioning and closure of box (pressure sensitive tape may be used) must be such that a representative box, with inside glass bottle filled with water, shall be capable of withstanding two drops from a height of 4 feet onto solid concrete without breakage of inner bottle or failure of the closure.

(11) Spec. 12A (§ 178.210 of this subchapter). Fiberboard boxes with inside glass bottles not over 1 gallon capacity each. Not more than 4 inside containers exceeding 5 pints capacity each shall be packed in the outside container. Shipper must have established that the completed package meets test requirements prescribed by § 178.210-10 of this subchapter.

(12) Specification 37P (§ 178.133 of this subchapter). Steel drums with polyethylene liner (non-reusable container).

(13) Spec. 6D or 37M (nonreusable container) (§ 178.102 or 178.134 of this subchapter). Cylindrical steel overpacks with inside spec. 2S (§ 178.35 of this subchapter) polyethylene container.

(14) Spec. 12B (§ 178.205 of this subchapter). Corrugated fiberboard boxes with plastic bags as defined in § 178.205-37 of this subchapter. Marking prescribed in § 173.401(c) shall not be required.

(b) Shipments of electrolyte (acid) or corrosive battery fluid with vehicles or engine driven equipment offered for transportation by, for, or to the Departments of the Army, Navy, or Air Force of the U.S. Government are exempt from this chapter when packed as follows:

(1) In one inside glass or polyethylene bottle of not over 1-gallon capacity,

tightly and securely closed in a strong outside container. Inside glass bottle shall be cushioned therein on all sides with incombustible absorbent material in sufficient quantity to absorb liquid contents in event of breakage. When shipped within or on a motor vehicle or with engines or other mechanical apparatus the outside container must be so blocked, braced, or stayed that it cannot change position during transit.

(c) Electrolyte acid or corrosive battery fluid contained in polyethylene containers not over 2 quarts capacity each and packaged not more than three containers in specification 15A, 15B, 15C, 16A, or 19A wooden boxes (§§ 178.168, 178.169, 178.170, 178.185, 178.190 of this subchapter), or packaged as prescribed in paragraph (a) (6) of this section, and bearing a corrosive label, may be securely attached to self-propelled vehicles or mobile agricultural machinery.

(d) Strong, tightly closed metal drums not over 15 gallons capacity each, having not to exceed 25 eight-ounce polyethylene, or other suitable plastic bottles, securely cushioned therein. Shipments authorized only by, for, or to the Departments of the Army, Navy, or Air Force of the United States Government. The drum containing the electrolyte acid or corrosive battery fluid may be securely attached to another steel drum containing a dry, charged storage battery or batteries.

§ 173.258 Electrolyte, acid, or alkaline corrosive battery fluid, packed with storage batteries.

(a) Electrolyte, acid, or alkaline corrosive battery fluid, packed with storage batteries, except as provided in § 173.257 (a) (6), must be packed in specification containers as follows:

(1) Spec. 15D or 16B (§§ 178.171 or 178.186 of this subchapter). Wooden boxes with inside containers of glass bottles not over 1 gallon each nor over 2 gallons total in each outside container. Inside containers must be well cushioned and separated from batteries by a strong solid wooden partition.

(2) Electrolyte, acid, or alkaline corrosive battery fluid included with storage batteries and filling kits may be packed in strong plywood or wooden boxes when shipments are made by, for, or to the Departments of the Army, Navy,

or Air Force of the United States Government in outside containers of their specifications provided the electrolyte, acid, or alkaline corrosive battery fluid is packed in polyethylene bottles not over 32-ounce capacity each and not more than 24 bottles securely separated from storage batteries and kits may be shipped in one outside package.

(3) Specification 12B (§ 178.205 of this subchapter). Fiberboard boxes with not more than 12 inside packagings of polyethylene or other material resistant to the lading, not over 64-ounce capacity each. Polyethylene packagings that are not rigid or semi-rigid in nature must be contained in other strong inside packagings; minimum thickness of polyethylene or other plastic material may be not less than 0.003-inch for any film sheet for multi-wall packagings or not less than 0.006-inch for single-wall packagings. Inside packagings must be adequately separated from the storage battery. Authorized gross weight not over 56 pounds. (See § 178.205-33 of this subchapter.)

§ 173.259 Electrolyte, acid, or alkaline corrosive battery fluid, packed with battery charger, radio current supply device, or electronic equipment and actuating devices.

(a) Electrolyte, acid, or alkaline corrosive battery fluid packed with battery charger, radio current supply device or parts thereof, or electronic equipment and actuating devices, with only one device or outfit in each package, in the amount necessary for operation of the device or equipment, provided the containers of electrolyte, acid, or alkaline corrosive battery fluid, are adequately cushioned to prevent breakage, leakage, or damage to other articles packed therewith, must be packed in specification containers or as otherwise authorized herein, as follows:

(1) Spec. 15A, 15B, 15C, 16A, or 19A (§ 178.168, § 178.169, § 178.170, § 178.185, or § 178.190 of this subchapter). Wooden boxes, provided the liquid is in bottles securely closed and cushioned as prescribed in paragraph (a) of this section, and separated from charger supply device, and parts, or electronic equipment by a strong solid wooden partition.

(2) Spec. 12B (§ 178.205 of this subchapter). Fiberboard boxes, when the liquid is in a strong bottle not exceeding 16 fluid ounces, which must be securely closed and cushioned as prescribed in

paragraph (a) of this section. Not more than 12 such packages may be packed under the provisions of § 173.25.

(3) Electrolyte, acid, or alkaline corrosive battery fluid, in separate inside acid or alkaline fluid resistant containers not over 5 gallons capacity each included with electronic equipment and actuating devices, are authorized in strong, tightly closed steel drums

§ 173.260 Electric storage batteries, wet.

(a) Electric storage batteries, containing electrolyte acid or alkaline corrosive battery fluid, must be completely protected so that short circuits will be prevented; they must not be packed with other articles except as provided in §§ 173.250 and 173.258, portable searchlights properly cushioned, battery parts, or hydrometers, securely packed in a separate container. The batteries either with or without other articles must be packed in specification containers as follows:

(1) Spec. 15D or 16B (§§ 178.171 or 178.186 of this subchapter). Wooden or wirebound wooden boxes except as provided in paragraphs (b) and (c) of this section.

(2) Spec. 12B (§ 178.205 of this subchapter). Fiberboard box as authorized by §§ 178.205-25(a), 178.205-28(a), and 178.205-35(a) of this subchapter.

(3) Electric storage batteries with case of asphaltum composition, impregnated rubber, steel case type, synthetic resin (plastic), or wooden battery box type, protected against short circuits and firmly secured to skids or pallets capable of withstanding the shocks normally incident to transportation, are exempt from specification packaging requirements. The height of the completed unit must not exceed 1 1/2 times the width of the skid or pallet. The unit must weigh not less than 300 pounds gross and must not fail under a superimposed weight equal to two times the weight of the unit or a superimposed weight of 4,000 pounds if the weight of the unit exceeds 2,000 pounds. Battery terminals must not be relied upon to support any part of the superimposed weight.

(b) Electric storage batteries with case of asphaltum composition, impregnated rubber, steel case type, synthetic resin (plastic), or wooden battery box type: packing authorized as follows:

(1) One to three batteries not over 25

pounds each in outside box, gross weight not over 75 pounds; specification container not required.

(2) Not more than four batteries not over 15 pounds each may be packed in strong outside fiberboard or wooden boxes, when securely cushioned and packed to prevent short circuits; specification container not required. Authorized gross weight 65 pounds.

(3) Not more than five batteries not over 10 pounds each may be packed in strong outside fiberboard or wooden boxes, when securely cushioned and packed to prevent short circuits; specification container not required. Authorized gross weight 65 pounds.

(c) Single batteries not exceeding 75 pounds each, in addition to requirements of paragraphs (a) and (b) of this section, may be shipped in 5-sided slip covers or in completely closed fiberboard boxes, of solid or double-faced corrugated fiberboard complying with the following: (See par. (a) (1) of this section for more than one battery in an outside container.)

(1) Slip cover or fiberboard box must fit snugly and provide inside top clearance of at least $\frac{1}{2}$ inch above battery terminals and filler caps with reinforcement in place. Assembled for shipment, the bottom edges of the slip cover may extend to the base of the battery but must not expose more than 1 inch thereof.

(2) Top of slip cover or fiberboard box design must comply with the following:

(i) Top of slip cover or fiberboard box must have interior reinforcement (insert or saddle) of fiberboard, wood, or other material of equal strength and rigidity so formed that any superimposed weight will bear only and directly downward on the top edges of the battery case or intercell connectors (straps), or plastic battery terminal covers designed to transmit any superimposed weight directly to the top inner wall of the battery case, or fiberboard boxes with chip board and chip board jute lined tubes which shall fit directly over the terminal posts and rest directly on battery cell covers.

(ii) Or be protected by a scored one piece cover-liner of 200-pound test (Mullen or Cady) double-faced corrugated fiberboard extending from the base of the battery on one side, across the top of the battery and to the base of the battery on the opposite side.

(iii) Or a five-sided slip cover having top of only one thickness of fiberboard, with lengthwise inner flaps roll folded to form a reinforcement of such height as to provide clearance required by subparagraph (1) of this paragraph which shall rest on the side edges of the battery. Outer end flaps to overlap approximately one inch and shall be butt folded and tucked into a center slot cut in the inner flaps. The requirements of subdivision (i) and (iv) of this subparagraph do not apply.

(iv) When top of slip cover or fiberboard box consists of only one thickness of material, reinforcement must have a plane surface of same interior dimensions and thickness. Reinforcement must be of such height as to provide minimum clearance required above and must be constructed to remain securely in place or be fastened to slip cover or fiberboard box.

(3) All fiberboard must be at least 200 pound test (Mullen) and completed package (battery and slip cover or fiberboard box) must be capable of withstanding top-to-bottom compression test of at least 500 pounds without damage to battery terminals, battery cell covers, and filler caps.

(d) Electric storage batteries, containing electrolyte or corrosive battery fluid, of the nonspillable type, must be protected against short circuits, and if completely and securely boxed are not subject to any other requirements of this subchapter.

(e) Electric storage batteries containing electrolyte or corrosive battery fluid are not subject to the requirements of this subchapter if:

(1) No other hazardous materials are transported in the same vehicle,

(2) The batteries are loaded or braced so as to prevent damage and short circuits in transit,

(3) Any other material loaded in the same vehicle is blocked, braced, or otherwise secured to prevent contact with or damage to the batteries, and

(4) The transport vehicle is carrying no material shipped by any person other than the shipper of the batteries.

(f) Electric storage batteries containing electrolyte or corrosive battery fluid, other than those of the nonspillable type, when shipped in less-than-truckload lots, must be marked and labeled as prescribed in Part 172 of this subchapter.

(g) Electric storage batteries, containing electrolyte or corrosive battery fluid in a coil from which it is injected into the battery cells by a gas generator and initiator assembled with the battery, and which are nonspillable and leakproof, are not subject to the requirements of this subchapter when approved by the Bureau of Explosives.

§ 173.261 Fire-extinguisher charges.

(a) Fire-extinguisher charges consisting of sulfuric acid in glass inside containers securely closed may be packed with bicarbonate of soda in specification containers as follows:

(1) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 178.168, 178.169, 178.170, 178.185, or 178.190 of this subchapter). Wooden boxes with glass inside containers not over 5 pints each, cushioned.

(2) Spec. 21C (§ 178.224 of this subchapter). Fiber drums with a single inside container consisting of a glass bottle not over 64 fluid ounces capacity filled with not over six pounds by weight of sulfuric acid (approximately 50 fluid ounces by volume). Bottle must be suspended in center of outside container by means of adequate supports and surrounded by bicarbonate of soda in sufficient quantity to fill drum and neutralize contents in the event of breakage.

(b) Limited quantities of fire-extinguisher charges as described in paragraphs (b) (1) through (3) of this section are excepted from labeling and the specification packaging requirements. In addition, shipments are not subject to Part 172 or Part 177 of this subchapter.

(1) Fire-extinguisher charges consisting of sulfuric acid in strong 8-fluid ounce or smaller bottles, securely closed and packed with bicarbonate of soda completely surrounding the bottles of acid in outside fiberboard or wooden boxes. Closure must consist of a metal cap lined with an acid-resistant washer or a composition stopper of material that will not be attacked by the acid.

(2) Fire-extinguisher charges, consisting of chlorosulfonic acid in a hermetically sealed bottle not exceeding 2 ounces capacity, securely packed in a metal container inclosed in another metal container, the inner metal container being cushioned in the outer metal container with asbestos fabric and the completed package embedded in potassium carbonate in outside fiberboard or wooden boxes.

(3) Fire-extinguisher charges, consisting of sulfuric acid in 10-ounce or smaller bottles, securely closed, packed in a tight fiber carton. Closure must consist of a metal cap lined with an acid-resistant washer or a composition stopper of material that will not be attacked by the acid. The bottle and carton packed in either potassium carbonate or potassium carbonate and alkali packed in a cylindrical tin can, with slip cover, secured by tape in outside fiberboard or wooden boxes.

§ 173.262 Hydrobromic acid.

(a) Hydrobromic acid not over 49 percent strength must be packed in specification containers as follows:

(1) Specification 1A, 1C, 1D, or 1E (§§ 178.1, 178.3, 178.4, 178.7 of this subchapter). Carboys in boxes, kegs, or plywood drums.

(2) Spec. 1X (§ 178.5 of this subchapter). Boxed carboys; single-trip for export only. For shipment by common carriers by water to noncontiguous territories or possessions of the United States and foreign countries; shipments from inland points in the United States which are consigned to such destinations are authorized to be transported to ship side in truckload lots only.

(3) [Reserved]

(4) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 178.168, 178.169, 178.170, 178.185, or 178.190 of this subchapter). Wooden boxes with inside containers which must be glass or earthenware, not over 1 gallon each, except that inside containers up to 3 gallons are authorized when only one is packed in each outside container.

(5) Spec. 43A (§ 178.18 of this subchapter). Rubber drums. Any such container showing evidence of damage must be tested to 20 pounds hydrostatic pressure, without leakage, before using.

(6) [Reserved]

(7) Spec. 12A (§ 178.210 of this subchapter). Fiberboard boxes with inside glass bottles not over 5 pints capacity each. Not more than six 5-pint glass bottles may be packed in one outside container. Shipper must have established that the completed package meets test requirements prescribed by § 178.210-10 of this subchapter.

(8) Specification 37P (§ 178.133 of this subchapter). Steel drum, not over 5 gallons capacity, with polyethylene liner (non-reusable container). A drum exceeding 1 gallon capacity must be constructed of at least 24 gauge metal.

(9) Spec. 22C (§ 178.198 of this subchapter). Plywood drum as prescribed by § 178.198-2(a) of this subchapter, with inside spec. 2T (§ 178.21 of this subchapter) polyethylene container.

(10) Spec. 6D (§ 178.102 of this subchapter). Cylindrical steel overpack with inside spec. 2S (§ 178.35 of this subchapter) polyethylene container.

(11) Specification MC 310, MC 311, or MC 312 (§ 178.343 of this subchapter). Tank motor vehicles, rubber-lined.

(12) Specification 37M (§ 178.134 of this subchapter) (non-reuseable) cylindrical steel overpack with inside Specification 2SL (§ 178.35a of this subchapter) polyethylene container. Overpack must have rolled hoops and be constructed of 20-gauge body and 18-gauge head.

(b) Hydrobromic acid greater than 49 percent strength but not over 63 percent strength must be packed in specification containers as follows:

(1) Spec. 22C (§ 178.198 of this subchapter). Plywood drum as prescribed by § 178.198-2(a) of this subchapter, with spec. 2T (§ 178.21 of this subchapter) polyethylene container.

(2) Specification 6D (§ 178.102 of this subchapter). Cylindrical steel overpack with inside Specification 2S or 2SL (§§ 178.35, 178.35a of this subchapter) polyethylene container.

(3) Spec. 15A (§ 178.168 of this subchapter). Wooden box having only one polyethylene bottle, with screw-cap closure, not over one-gallon capacity.

(4) Specification MC 310, MC 311, or MC 312 (§ 178.343 of this subchapter). Tank motor vehicles, rubber-lined.

§ 173.263 Hydrochloric (muriatic) acid; hydrochloric (muriatic) acid mixtures; hydrochloric (muriatic) acid solution, inhibited; sodium chlorite solution (not exceeding 42 percent sodium chlorite); and cleaning compounds, liquids, containing hydrochloric (muriatic) acid.

(a) Hydrochloric (muriatic) acid, hydrochloric (muriatic) acid mixtures, hydrochloric (muriatic) acid solution, inhibited, sodium chlorite solution not exceeding 42 percent sodium chlorite, and cleaning compounds, liquid, containing hydrochloric (muriatic) acid must be packed in specification containers as follows:

(1) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 178.168, 178.169, 178.170, 178.185, or 178.190 of this subchapter). Wooden

boxes with inside containers which must be glass, earthenware, polyethylene or other nonfragile plastic material resistant to the lading (bags are not authorized), not over 1 gallon each, except that inside containers up to 3 gallons each are authorized when only one is packed in each outside container.

(2) Spec. 5D (§ 178.84 of this subchapter). Rubber-lined metal barrels or drums. Any such container that shows evidence of damage must be tested, before shipment, for defect in lining in the manner prescribed in spec. 5D.

(3) Spec. 43A (§ 178.18 of this subchapter). Rubber drums.

(4) [Reserved]

(5) Specification 1A, 1C, or 1K (§§ 178.1, 178.3, 178.14 of this subchapter). Carboys in boxes or kegs.

(6) Spec. 1X (§ 178.5 of this subchapter). Boxed carboys; single-trip for export only. For shipment by common carriers by water to noncontiguous territories or possessions of the United States and foreign countries; shipments from inland points in the United States which are consigned to such destinations are authorized to be transported to ship side in truckload lots only.

(7) Specification 1D, 1E, or 1EX (single-trip) (§§ 178.4, 178.6, 178.7 of this subchapter). Glass carboys in boxes or plywood drums, of not over 6.5 gallon nominal capacity. Means must be provided so that accumulated total pressure in bottle may not exceed 10 p.s.i.g. at 130° F. (55° C.) or will vent at a pressure not to exceed 10 p.s.i.g.

(8) [Reserved]

(9) [Reserved]

(10) Specification MC 310, MC 311, or MC 312 (§ 178.343 of this subchapter). Tank motor vehicle lined with rubber or equally acid-resistant material of equivalent strength and durability. An unlined specification MC 311 or MC 312 tank motor vehicle made from Type 304L or 316 stainless steel is authorized for sodium chlorite solutions not exceeding 42 percent sodium chlorite only.

(11) Spec. 60 (§ 178.255 of this subchapter). Portable tanks, rubber-lined.

(12) [Reserved]

(13) Spec. 1H, 15P, or 22C (§§ 178.13, 178.182, or 178.198 of this subchapter). Metal crate with inside polyethylene

carboy; or glued plywood or wooden box, or plywood drum as prescribed by § 178.198-2(a) of this subchapter, with inside spec. 2T or spec. 2TL (§§ 178.21 or 178.27 of this subchapter) polyethylene container.

(14) Specifications 17H, 37A, or 37B (§§ 178.118, 178.131, 178.132, of this subchapter). Metal drums (single-trip) not over 5 gallons capacity each. Authorized only for 15 percent or less, inhibited hydrochloric (muriatic) acid solution. Drums must be lined throughout with a pliable plastic material impervious to the solution. Specifications 37A and 37B metal drums must be at least 24 gauge steel.

(15) Specification 12A or 12B (§§ 178.210, 178.205 of this subchapter). Fiberboard boxes with inside containers of polyethylene, or other nonfragile plastic material resistant to the lading (bags are not authorized, not over 1-gallon capacity each, or not more than one of 3-gallon capacity, suitably cushioned to prevent movement within the box. Gross weight of completed package must not exceed 65 pounds.

(16) Spec. 12A (§ 178.210 of this subchapter). Fiberboard boxes with inside glass bottles not over 5 pints capacity each. Not more than six 5-pint glass bottles may be packed in one outside container. Shipper must have established that the completed package meets test requirements prescribed by § 178.210-10 of this subchapter.

(17) Specification 6D or 37M (non-reusable container) (§§ 178.102, 178.134 of this subchapter). Cylindrical steel overpacks with inside Specifications 2S, 2SL, 2T, 2TL, or 2U (§§ 178.35, 178.35a, 178.21, 178.27, 178.24 of this subchapter) polyethylene container.

(18) Specification 37p (§ 178.133 of this subchapter). Steel drums constructed of at least 24-gauge metal for drums exceeding 1 gallon capacity, with polyethylene liner (nonreusable container).

(19) Spec. 16D (§ 178.187 of this subchapter). Wirebound wooden overwrap, with inside spec. 2T, 2TL, 2S, or 2SL (§§ 178.21, 178.27, 178.35, or 178.35a of this subchapter) polyethylene container.

(20) [Reserved]

(21) Spec. 12C (§ 178.206 of this subchapter). Fiberboard boxes with inside 5-gallon nominal capacity polyethylene bottles having minimum wall thickness

of 0.015 inch and constructed with screw-type closures. Authorized gross weight not over 65 pounds. (See § 178.206-19 of this subchapter.)

(22) Spec. 21P (§ 178.225 of this subchapter). Fiber drum overpack with inside spec. 2T, 2S, 2SL, or 2U (§§ 178.21, 178.35, 178.35a, or 178.24 of this subchapter) polyethylene container.

(23) Specification 12p (§ 178.211 of this subchapter). Fiberboard boxes with inside specification 2U (§ 178.24 of this subchapter) polyethylene containers not over 5 gallons capacity each. Wire staples are not authorized for assembly or closure of boxes, except when polyethylene container is completely enclosed in inside boxes free of wire staples or other projections that could cause failures.

(24) Specification 16A (§ 178.185 of this subchapter). Wirebound wooden box (§ 178.185-22 of this subchapter) with inside specification 2U (§ 178.24 of this subchapter) polyethylene container. The polyethylene container must be separated from the wooden box by a complete corrugated fiberboard liner and top and bottom pads.

(25) Spec. 22C (§ 178.198 of this subchapter). Plywood drum as prescribed by § 178.198-2(b), with inside spec. 2TL (§ 178.27 of this subchapter) polyethylene container not over 5 gallon nominal capacity.

(26) Spec. 33A (§ 178.150 of this subchapter). Polystyrene cases (nonreusable container) with inside glass bottles not over 5 pints capacity each. Not more than four 5-pint bottles may be packed in one outside container.

(27) Specification 12R (§ 178.212 of this subchapter). Paper-faced expanded polystyrene board box with not more than six inside glass bottles or specification 2E (§ 178.24a of this subchapter) inside polyethylene bottles, not over 5 pints capacity each.

(28) Spec. 34 (§ 178.19 of this subchapter). Polyethylene container without overpack, not over 30-gallons capacity.

(29) Specification 12R (§ 178.212 of this subchapter). Paper-faced expanded polystyrene board box with not more than four specification 2E (§ 178.24a of this subchapter) inside polyethylene bottles, not over 1-gallon capacity each.

(b) Hydrochloric acid of not over 20 percent strength (13.25° Baumé) and

other corrosive liquids containing not over 20 percent hydrochloric acid in addition to containers prescribed in paragraph (a) of this section may be shipped in specification containers as follows:

(1) [Reserved]

(2) Limited quantities of these materials in inside packaging of not more than 8 fluid ounces capacity each, packed in strong outside packagings, and cushioned with absorbent material in sufficient quantity to completely absorb liquid contents in the event of breakage, are excepted from labeling and the specification packaging requirements of this subchapter. In addition, shipments are not subject to Part 172 or Part 177 of this subchapter.

(c) When hydrochloric acid contains oils or solvents it must not be shipped in containers lined with rubber.

(d) Hydrochloric acid mixtures of not over 28 percent strength, or cleaning compounds, liquid, containing not over 28 percent hydrochloric (muriatic) acid, in addition to the provisions of paragraphs (a) and (b) of this section, may be packed in specification containers as follows:

(1) Spec. 12B (§ 178.205 of this subchapter). Fiberboard boxes constructed of at least 275-pound test (Mullen or Cady) double-wall corrugated fiberboard or 325-pound test (Mullen or Cady) double-faced corrugated fiberboard, with not more than 12 inside glass bottles, having acid-proof closures, of not over 32 ounces capacity each. Inside glass bottles must be separated and cushioned by suitable corrugated fiberboard partitions. The box must be equipped with top and bottom pads. (See § 178.205-32 of this subchapter.)

(2) Spec. 12A (§ 178.210 of this subchapter). Fiberboard boxes with inside glass bottles not over 1 gallon capacity each. Not more than 4 inside containers exceeding 5 pints capacity each shall be in the outside container. Shipper must have established that the completed package meets test requirements prescribed by § 178.210-10 of this subchapter.

(e) Special exceptions for the shipment of certain dilute hydrochloric acid solutions in the ORM-D class are provided in Subpart N of this part.

§ 173.264 Hydrofluoric acid; White acid.

(a) Hydrofluoric acid and white acid (ammonium bifluoride and hydrochloric

acid mixture), each must be packed in specification packaging as follows:

(1) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 178.168, 178.169, 178.170, 178.185, or 178.190 of this subchapter). Wooden boxes with inside containers of natural rubber, ceresine, lead, or other hydrofluoric acid resistant material. These containers are authorized only for strengths of acid for which they are adequate, but in no case may the strength of acid exceed 70 percent.

(2) Specification 12B (§ 178.205 of this subchapter). Fiberboard boxes with Specification 2E (§ 178.24a of this subchapter) inside polyethylene bottles or inside receptacles of not over 1 pound capacity each, made of natural rubber, lead, or other hydrofluoric acid resistant plastic. Authorized only for acid not over 70 percent in strength.

(3) Spec. 16D (§ 178.187 of this subchapter). Wirebound wooden overwrap, with inside spec. 2T (§ 178.21 of this subchapter) polyethylene container. Authorized for hydrofluoric acid not over 70 percent strength.

(4) Specification 12A or 12B (§§ 178.210, 178.205 of this subchapter). Fiberboard boxes with not more than four Specification 2E (§ 178.24a of this subchapter) inside polyethylene bottles, having a minimum thickness of 0.030 inch and not over 1 gallon (nominal) capacity each. Bottle closures must be made secure by sealing with pressure-sensitive plastic tape or other equally efficient means. Authorized for acid not over 70 percent strength. Authorized gross weight for Specification 12B fiberboard boxes not over 65 pounds; Specification 12A not over 80 pounds.

(5) [Reserved]

(6) [Reserved]

(7) Spec. 5A (§ 178.81 of this subchapter). Unlined metal barrels or drums which have been subjected to adequate passivation or neutralization process (see Note 1). Authorized only for acid of not less than 60 percent and not more than 80 percent strength and all containers must be filled to not over 80 percent of capacity at 68° F. If containers are washed out with water, they must be re-passivated before reshipment. (See Notes 1, 2, 3 and 5.)

NOTE 1: Each metal container, before being put into service must be passivated by an efficient method.

NOTE 2: Containers not exceeding 55 gallons capacity each are authorized for truckload, and less-than-truckload shipment. Containers exceeding 55 gallons capacity each are authorized for truckload shipments only but they must be loaded by consignor and unloaded by consignee.

NOTE 3: For less-than-truckload shipments, containers must be of metal at least as heavy as 14 gauge United States standard for not over 20 gallons capacity each or 12 gauge for not over 55 gallons capacity each. Each container must be subjected to at least one of the following tests before shipment: By interior pressure of at least 15 pounds per square inch before filling or by holding for inspection for at least 24 hours after filling. In either case, each container must be vented prior to shipment.

NOTE 4: [Reserved]

NOTE 5: Hydrofluoric acid solutions and concentrations of 60 percent up to 65 percent, when shipped in unlined steel containers, must be inhibited so that the corrosive effect on steel must not be greater than that of hydrofluoric acid of 65 percent concentration.

(3) [Reserved]

(9) Spec. 43A (§ 178.18 of this subchapter). Rubber drums. Authorized only for acid not over 65 percent strength. Any such container showing evidence of damage must be tested to 20 pounds hydrostatic pressure, without leakage, before using.

(10) Spec. 5D (§ 178.84 of this subchapter). Lined metal barrels or drums. Authorized only for acid not over 62 percent strength. Any barrel or drum that shows evidence of damage must be tested before shipment for defects in lining in the manner prescribed in § 178.84-15(a) of this subchapter. Lining materials must meet the test prescribed in Notes 1, 2, and 3 below.

NOTE 1: Performance test. Test panels of linings for drums in hydrofluoric acid service must be subjected to a test in 62 percent hydrofluoric acid for a period of not less than 90 days. At the end of such period there must be no signs of deterioration of such lining material from chemical attack as evidenced by changes in its physical characteristics, and no signs of permeation of hydrofluoric acid through the sample as evidenced by blistering from the metal insert.

NOTE 2: Method of test. The test panel should be at least 2 inches by 6 inches with a steel insert completely covered by lining material. Test panels should be immersed in 62 percent hydrofluoric acid so that 50 percent

of the panel is in contact with liquid and 50 percent in contact with vapor. Temperature of test to be maintained at 130° F. for the entire 90 days.

NOTE 3: Drums must be lined with material at least as thick as the sample material tested.

(11) [Reserved]

(12) [Reserved]

(13) [Reserved]

(14) Specification MC 310, MC 311, or MC 312 (§ 178.343 of this subchapter). Tank motor vehicles.

NOTE 1: Hydrofluoric acid solutions and concentrations of 60 percent up to 65 percent, when shipped in unlined tank motor vehicles, must be inhibited so that the corrosive effect on steel must not be greater than that of hydrofluoric acid of 65 percent concentration.

(15) [Reserved]

(16) Spec. 15P or 22C (§§ 178.182 or 178.198 of this subchapter). Glued plywood or wooden box, or plywood drum as prescribed by § 178.198-2(a) of this subchapter, with inside spec. 2T (§ 178.21 of this subchapter) polyethylene container. Authorized for acid not over 70 percent strength.

(17) Specification 6D (§ 178.102 of this subchapter) or 37M (nonreusable) (§ 178.134 of this subchapter) cylindrical steel overpacks with inside specifications 2S, 2SL, or 2T (§§ 178.35, 178.35a, 178.21 of this subchapter) polyethylene liners. Specification 37M overpack of over 15-gallon capacity must be constructed of at least 20-gauge steel. Authorized only for acid of not over 70 percent strength.

(18) [Reserved]

(19) Spec. 12P (§ 178.211 of this subchapter). Fiberboard boxes with one inside spec. 2TL (§ 178.27 of this subchapter) polyethylene bottle with screw-cap closure and having minimum wall thickness of 0.015 inch, not over 5 gallons capacity each. Wire staples are not authorized for assembly or closure of boxes when any such staple is in direct contact with the inside plastic container. Authorized only for acid of 48 to 52 percent strength.

(b) Hydrofluoric acid, anhydrous (hydrogen fluoride) must be shipped in specification containers as follows:

(1) Spec. 3, 3A, 3AA, 3B, 3C, 3E, 4,

4A, 25, or 38 (§ 178.36, 178.37, 178.38, 178.40, 178.42, 178.48 or 178.49 of this subchapter); also spec. 4B, 4BA, or 4C (§ 178.50, 178.51 or 178.52 of this subchapter) if not brazed. Cylinders. Filling density must not exceed 85 percent of the pounds water weight capacity of the cylinder. Cylinders used exclusively in this service may, in lieu of the periodic hydrostatic retest required by § 173.34(e), be given a complete external visual inspection at the time such periodic retest becomes due. Such inspections shall be made only by competent persons and shall be made on cylinders cleaned to bare metal and results recorded on a suitable data sheet, completed copies of which shall be kept as prescribed in § 173.34(e)(5). Points to be checked and recorded on these data sheets are: Date of inspection (month and year); DOT specification number; cylinder identification (registered symbol and serial number, date of manufacture, and if needed for adequate identification, ownership symbol); tare weight; physical condition (record specifically, if present; leakage, corrosion, gouges, dents or digs in shell or heads, broken or damaged footring or protective ring or fire damage); disposition of cylinders (returned to service, to cylinder manufacturer for repairs, or scrapped). A cylinder which passes the inspection prescribed shall have the data recorded in the manner presently prescribed for the recording of the retest date except that an "E" is to follow the date (month and year) indicating requalification by the external inspection method. Cylinders removed from this service for any reason must be rendered unfit for any other regulatory service (see § 173.28(l)).

(2) [Reserved]

(3) Specification MC 310, MC 311, or MC 312 (§ 178.343 of this subchapter). Tank motor vehicles.

(4) Spec. 51 (§ 178.245 of this subchapter). Portable tanks.

(5) [Reserved]

(6) Specification 106A500X or 110A-500W (§§ 179.300, 179.301 of this subchapter) tanks. Tanks may not be equipped with safety devices of any type and valves must be protected by metal caps. Tanks may not be filled to a density in excess of 85 percent of the water weight capacity of the tank. (See § 177.834(m) of this subchapter for

special requirements for highway shipments.)

(c) Containers must not be entirely filled. Unless otherwise provided in this part, sufficient outage (vacant space) must be allowed so that the liquid portion will not completely fill the container at 130° F. in order to prevent leakage or distortion of containers due to the expansion of the contents from increase in temperature during transit.

§ 173.265 Hydrofluosilicic acid.

(a) Hydrofluosilicic acid must be packed in specification containers as follows:

(1) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 178.168, 178.169, 178.170, 178.185, or 178.190 of this subchapter). Wooden boxes with inside containers of natural rubber, ceresine, or other material of equal efficiency resistant to hydrofluosilicic acid.

(2) [Reserved]

(3) [Reserved]

(4) Specification 16A (§ 178.185 of this subchapter). Wirebound wooden box (§ 178.185-22 of this subchapter) with inside specification 2U (§ 178.24 of this subchapter) polyethylene container. The polyethylene container must be separated from the wooden box by a complete corrugated fiberboard liner and top and bottom pads.

(b) Hydrofluosilicic acid of not exceeding 40 percent strength may also be shipped when packed in specification containers as follows:

(1) Spec. 5D (§ 178.84 of this subchapter). Rubber-lined metal barrels or drums. Any barrel or drum that shows evidence of damage must be tested before shipment for defect in lining in the manner prescribed in spec. 5D.

(2) Spec. 43A (§ 178.18 of this subchapter). Rubber drums. Any drum showing evidence of damage must be tested to 20 pounds hydrostatic pressure, without leakage, before using.

(3) [Reserved]

(4) Specification MC 310, MC 311, or MC 312 (§ 178.343 of this subchapter). Tank motor vehicles, lined with rubber.

(c) Hydrofluosilicic acid containing no free hydrofluoric acid or other ingredient that will attack glass, may also be shipped when packed in specification containers as follows:

(1) Specification 1A, 1C, 1D, or 1E

(§§ 178.1, 178.3, 178.4, 178.7 of this subchapter). Carboys in boxes, in kegs, or plywood drums, for which the use of rubber stoppers and gaskets is also authorized.

(2) Spec. IX (§ 178.5 of this subchapter). Boxed carboys; single-trip for export only. For shipment by common carriers by water to noncontiguous territories or possessions of the United States and foreign countries; shipments from inland points in the United States which are consigned to such destinations are authorized to be transported to ship side in truckload lots only.

(3) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 178.168, 178.169, 178.170, 178.185, or 178.190 of this subchapter). Wooden boxes with inside glass containers, not over 1 gallon each, with rubber or ground-in glass stoppers properly secured.

(4) The vacant space in containers of these acids must be sufficient so that when raised to a uniform temperature of 130° F. the vapor pressure shall not exceed 6 pounds per square inch.

(d) Hydrofluosilicic acid of not exceeding 32 percent strength may also be shipped when packed in specification containers as follows:

(1) Specification 12B (§ 178.205 of this subchapter). Fiberboard boxes with Specification 2E (§ 178.24a of this subchapter) inside polyethylene bottles or other plastic material resistant to the lading, not over 1-quart capacity each, suitably cushioned to prevent movement within the box. Gross weight of complete package must not exceed 65 pounds.

(2) Spec. 15P or 22C (§§ 178.182 or 178.198 of this subchapter). Glued plywood or wooden box, or plywood drum as prescribed by § 178.198-2(a) of this subchapter, with inside spec. 2T (§ 178.21 of this subchapter) polyethylene container.

(3) Spec. 6D or 37M (nonreusable container) (§ 178.102 or 178.134 of this subchapter). Cylindrical steel overpacks with inside spec. 2S or 2SL (§ 178.35 or 178.35a of this subchapter) polyethylene container. Spec. 37M overpack shall be constructed of at least 20-gauge steel and steel and shall not exceed 16 gallons capacity each.

(4) Specification 37P (§ 178.133 of this subchapter). Steel drums, not over 5-gallons capacity, with polyethylene liner (non-reusable container).

(5) Spec. 21P (§ 178.225 of this sub-

chapter). Fiber drum overpack with inside spec. 2S, 2SL or 2U (§§ 178.35, 178.35a, or 178.24 of this subchapter) polyethylene container.

(6) Specification 34 (§ 178.19 of this subchapter). Polyethylene container without overpack, not over 30-gallon capacity.

§ 173.266 Hydrogen peroxide solution in water.

(a) Hydrogen peroxide solution in water containing over 52 percent hydrogen peroxide by weight must be packed in specification containers as follows:

(1) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 178.168, 178.169, 178.170, 178.185 or 178.190 of this subchapter). Wooden boxes with inside containers consisting of glass bottles not over 1 quart capacity each; bottles must have vented closure and must be packed in a metal container vented at bottom packed in another metal container vented at top; cushioning material shall be used between glass bottle and inner container and between inner and outer metal containers; cushioning material shall be vermiculite or equivalent in an amount at least 10 times the volume of the solution shipped and shall be wet with at least 10 percent water by volume to which has been added a stabilizing agent.

(2) Spec. 42D (§ 178.109 of this subchapter). Aluminum drums with vented closure in top head; not over 30 gallons capacity; side openings not permitted. Top head must be plainly marked "Keep This End Up" or "Keep Plug Up To Prevent Spillage."

(b) Hydrogen peroxide solution in water containing 52 percent or less hydrogen peroxide by weight must be packaged as prescribed in paragraph (a) of this section or as follows:

(1) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 178.168, 178.170, 178.185, 178.190 of this subchapter). Wooden boxes with glass or earthenware inside containers of not more than 1 gallon capacity each. Inside containers must be well cushioned. All material used for cushioning must be noncombustible mineral matter, such as whiting, mineral wool, infusorial earth, asbestos, or sifted ashes. Cushioning of inside containers in outside wooden boxes by means of elastic packing, such as wooden strips or large corks fastened securely in position, is authorized if the completed package will pass the swing test prescribed for boxed carboys in spec. 1A (§ 178.1 of this subchapter).

(2) Spec. 34B (§ 178.12 of this subchapter). Aluminum carboys.

(3) Spec. 42D (§ 178.109 of this subchapter). Aluminum drums with vented closure in top head; not over 55 gallons capacity. Top heads must be plainly marked "Keep This End Up" or "Keep Plug Up To Prevent Spillage."

(4) Spec. 42E (§ 178.136 of this subchapter). Aluminum drums (single-trip).

(5) Specification 12B (§ 178.205 of this subchapter). Fiberboard boxes with Specification 2E (§ 178.24a of this subchapter) inside polyethylene bottles having vented screw-cap closures not over 16-ounce capacity each. Each bottle must be completely contained in a securely closed polyethylene bag or tube constructed of material having minimum film thickness of 0.004 inch. Bottles must be separated from each other by use of fiberboard partitions or other suitable cushioning material. Not more than 12 bottles may be packaged in one box.

(6) Spec. 6D or 37M (nonreusable container) (§ 178.102 or § 178.134 of this subchapter). Cylindrical steel overpacks with inside spec. 2S or 2SL (§ 178.35 or § 178.35a of this subchapter) polyethylene container. The closure must be located in one head and must be vented to prevent accumulation of internal pressure and head plainly marked "KEEP THIS END UP" or "KEEP PLUG UP TO PREVENT SPILLAGE."

(7) Spec. 21P (§ 178.225 of this subchapter). Fiber drum over pack with inside spec. 2SL (§ 178.35a of this subchapter) polyethylene container, not over 30 gallons capacity, or spec. 2U (§ 178.24 of this subchapter) polyethylene container not over 15 gallons capacity. The closures of the inside 2SL and 2U container must be vented to prevent accumulation of internal pressure and the head with the closure must be marked "KEEP THIS END UP" or "KEEP PLUG UP TO PREVENT SPILLAGE."

(8) Specification 34 (§ 178.19 of this subchapter). Polyethylene container without overpack, not over 30-gallon capacity. A closure of each container must be vented to prevent accumulation of internal pressure and the head with the closure must be marked "KEEP THIS END UP."

(9) Specification 37P (§ 178.133 of this subchapter). Steel drums, not over 15-gallon capacity, with inside Specification 2U (§ 178.24 of this subchapter) polyethylene containers having a minimum

thickness of 0.015 mil. The closure of the inside 2U container must be vented to prevent accumulation of internal pressure and the head with the closure must be marked "KEEP THIS END UP" or "KEEP PLUG UP TO PREVENT SPILLAGE".

(c) Hydrogen peroxide solution in water containing over 8 percent hydrogen peroxide by weight and not exceeding 37 percent must be packaged as prescribed in paragraph (a) or (b) of this section or as follows:

(1) Specification 1A (§ 178.1 of this subchapter). Glass carboys. The cushioning must be non-combustible mineral material, elastic wooden-strip packing, or large elastic cushions such as corks fastened securely in position. The use of hay, excelsior, ground cork, or similar material, whether treated or untreated, is prohibited. The carboy stoppers must be vented so as to prevent accumulation of internal pressure; use of cork gasket impregnated with paraffin is authorized.

(2) Spec. 1X (§ 178.5 of this subchapter). Boxed carboys; single-trip for export only. For shipment by common carriers by water to noncontiguous territories or possessions of the United States and foreign countries; shipments from inland points in the United States which are consigned to such destinations are authorized to be transported to ship side in truckload lots only.

(3) Specification 1D or 1E (§ 178.4, 178.7 of this subchapter). Glass carboys in boxes or plywood drums of not over 6.5 gallons nominal capacity. Means must be provided so that accumulated pressure in bottle may not exceed 10 pounds p.s.i.g. at 130° F. or will vent at a pressure not to exceed 10 pounds p.s.i.g. The cushioning must be non-combustible mineral material, elastic wooden-strip packaging, or large elastic cushions such as corks fastened securely in position. The use of hay, excelsior, ground cork, or similar material, whether treated or untreated, is prohibited.

(4) Spec. 15A, 15B, 15C, 16A, or 19A (§ 178.168 § 178.169, § 178.170, § 178.185, or § 178.190 of this subchapter). Wooden boxes with inside containers of polyethylene, or other plastic material resistant to the lading, not over 1 pint capacity or 16 ounces by weight each. Inside containers must be securely cushioned with

incombustible mineral matter, such as whiting, mineral wool, infusorial earth, asbestos, or sifted ashes.

(5) Spec. 1H, 15P, or 22C (§§ 178.13, 178.182 or 178.198 of this subchapter). Metal crate with inside polyethylene carboy; or glued plywood or wooden box, or plywood drum as prescribed by § 178.198-2(a) of this subchapter, with inside spec. 2T (§ 178.21 of this subchapter) polyethylene container.

(6) Spec. 12B (§ 178.205 of this subchapter). Fiberboard boxes, with inside aluminum bottles constructed of at least 99 percent pure aluminum of not over 5 pounds or 5 pints capacity each. Each bottle shall be individually partitioned and surrounded by incombustible mineral packing material in the outside shipping container. Bottle closure shall be by means of a threaded aluminum cap, fitted with polyethylene gasket or other equally efficient closing device. A venting device which will not leak liquid under conditions normally incident to transportation is permitted.

(7) [Reserved]

(8) Spec. 12B (§ 178.205 of this subchapter). Fiberboard boxes with inside polyethylene bottles not over 1 gallon capacity each with vented closures; such bottles over 32 ounces capacity each must be completely contained in a securely closed polyethylene bag or tube constructed of material having minimum film thickness of 0.003 inch. Alkaline solutions containing sodium hydroxide or other alkaline materials packed in glass or polyethylene bottles not over 1 gallon capacity each and with hydrogen peroxide solution contained in polyethylene bottles not over 1 gallon capacity each, when shipped as a wood bleach preparation, may be packed together in inside chipboard or corrugated fiberboard boxes or separated by corrugated fiberboard partitions; not more than six inside chipboard or corrugated fiberboard boxes having inside bottles not over 32 ounces each, or more than 4 one gallon bottles separated by corrugated fiberboard partitions may be packed in one outside box; completed package with mixed contents must be capable of withstanding a drop from a height of four feet onto solid concrete without failure of any inside container.

(9) Spec. 12A (§ 178.210 of this subchapter). Fiberboard boxes with inside glass or polyethylene bottles, not over 1-gallon capacity each. Each bottle closure must be vented and each bottle com-

pletely contained in a securely closed polyethylene bag or tube constructed of material having minimum film thickness of 0.003 inch. Shipper must have established that completed package meets test requirements prescribed by § 178.210-10 of this subchapter.

(10) Spec. 16D (§ 178.187 of this subchapter). Wirebound wooden overwrap, with inside spec. 2T or 2TL (§§ 178.21 or 178.27 of this subchapter) polyethylene container.

(d) Hydrogen peroxide solution in water containing over 8 percent hydrogen peroxide by weight and not exceeding 10 percent must be packaged as prescribed in paragraph (a), (b), or (c) of this section or as follows:

(e) Hydrogen peroxide solution in water not exceeding 52 percent hydrogen peroxide by weight, when shipped in tank motor vehicles, or portable tanks in truck-load quantities only, is not subject to any other requirement of this chapter.

(f) Hydrogen peroxide solution in water exceeding 52 percent hydrogen peroxide by weight may also be packed in specification containers as follows:

(1) [Reserved]

(2) Specification MC 310 or MC 312 (§ 178.343 of this subchapter). Tank motor vehicles. Tanks shall be welded construction of aluminum complying with Aluminum Association Nos. 1060, 1260, 5254, or 5652, and having a minimum wall thickness of one-half inch. They must be built to a design working pressure of not less than 40 p.s.i.g. and shall be designed so that internal surfaces may be effectively cleaned and passivated. All openings in the tank shall be located on top of tank. All valves and safety devices shall be provided with overturn protection and dust covers. The tank metal identification plate required shall be marked "DOT MC 310-H₂O₂" or "DOT MC 312-AL-H₂O₂," as appropriate, and, in addition, the vehicle shall be clearly marked in letters not less than one inch high "FOR HYDROGEN PEROXIDE ONLY." Designs for venting and pressure relief devices must be approved by the Bureau of Explosives.

§ 173.267 Mixed acid (nitric and sulfuric acid) (nitrating acid).

(a) Mixed acid (nitric and sulfuric acid) (nitrating acid), must be packed in specification containers as follows:

(1) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 178.168, 178.169, 178.170, 178.185, or 178.190 of this subchapter). Wooden boxes with inside glass bottles not over 7 pounds capacity each, individually inclosed in tightly closed metal cans and cushioned therein with incombustible mineral material.

(2) Spec. 5C (§ 178.83 of this subchapter). Metal barrels or drums of Type 304 ELC or 347 stainless steel only. (See paragraph (b) of this section.)

(3) [Reserved]

(4) Spec. 1A or 1C (§§ 178.1 or 178.3 of this subchapter). Carboys in boxes or kegs. Authorized only for mixed nitric and sulfuric acid containing not over 17 percent nitric acid and containing at least 33 percent water. Straight-sided carboys must be used; cushioning must be incombustible mineral material, elastic wooden-strip packing, or large elastic cushions, such as cork, fastened securely in position. The use of hay, excelsior, ground cork, or similar material, whether treated or untreated, is prohibited.

(5) Spec. 1X (§ 178.5 of this subchapter). Boxed carboys; single-trip for export only. For shipment by common carriers by water to noncontiguous territories or possessions of the United States and foreign countries; shipments from inland points in the United States which are consigned to such destinations are authorized to be transported to ship side in truckload lots only.

(6) Spec. 1D, or 1E (§ 178.4, or § 178.7 of this subchapter). Glass carboys in boxes or plywood drums of not over 6.5 gallons nominal capacity; authorized only for mixed nitric and sulfuric acid, containing not over 17 percent nitric acid and containing at least 33 percent water; means shall be provided so that accumulated pressure in bottle shall not exceed 10 pounds per square inch gauge at 130° F., or vent at pressure not to exceed 10 pounds per square inch gauge. Cushioning must be incombustible mineral material, elastic wooden strip packing, or large elastic cushions such as cork fastened securely in position. The use of hay, excelsior, ground cork, or similar material, whether treated or untreated, is prohibited.

(7) Specifications MC 310, MC 311, or MC 312 (§ 178.343 of this subchapter). Tank motor vehicles. (See paragraph (b) of this section.)

(8) Spec. 60 (§ 178.255 of this subchapter). Portable tanks. (See paragraph (b) of this section.)

(9) Spec. 5A (§ 178.81 of this subchapter). Carbon steel barrels or drums. Authorized only for mixed acids containing less than 80 percent nitric acid. (See paragraph (b) of this section.)

(b) Mixtures of sulfuric acid and nitric acid (nitrating acid), shipped in tank car tanks, cargo tanks, tank trucks, or metal barrels or drums, shall contain not less than 10 percent sulfuric acid. These mixtures may contain:

(1) Up to 10 percent water with not less than 10 percent sulfuric acid.

(2) Up to 15 percent water with not less than 15 percent sulfuric acid.

(3) Up to 20 percent water with not less than 20 percent sulfuric acid.

(4) Up to 38 percent water with not less than 62 percent sulfuric acid.

§ 173.268 Nitric acid.

(a) Nitric acid exceeding 40 percent concentration in any quantity must not be packed with any other article.

(b) Nitric acid in any concentration which does not contain significant quantities of sulfuric acid or hydrochloric acid as impurities must be packed in specification containers as follows:

(1) [Reserved]

(2) [Reserved]

(3) Specifications MC 310, MC 311, or MC 312 (§ 178.343 of this subchapter). Tank motor vehicles.

(4) Specification 5C (§ 178.83 of this subchapter). Metal barrels or drums. Authorized for concentrations of nitric acid as limited by § 178.83-3(c) of this subchapter. Containers weighing less than 85 percent of their original marked weight are not authorized.

(5) Containers as specified in paragraphs (c), (d), (e), and (f), and within percentage limitations of this section.

(c) Nitric acid of 80 percent or greater concentration which does not contain significant quantities of sulfuric acid or hydrochloric acid as impurities in addition to and within limitations of paragraphs (b), (d), and (e) of this section, may be packed in specification containers as follows:

(1) Spec. 42B or 5X (§§ 178.107, or 178.91 of this subchapter); also 42,¹ if made and marked prior to October 1, 1930. Aluminum drums, or aluminum-lined steel drums.

¹ Use of existing drums authorized, but new construction not authorized.

(d) Nitric acid of 90 percent or greater concentration in addition to and within limitations of paragraphs (b) and (c) of this section, may be packed in specification containers as follows:

(1) Specification 15A, 15B, 15C, 16A, or 19A (§§ 178.168, 178.169, 178.170, 178.185, 178.190 of this subchapter). Wooden boxes with inside containers which must be glass bottles not over 5 pints capacity each, individually enclosed in tightly closed metal cans and cushioned therein with sufficient incombustible mineral material. (See paragraphs (g) and (h) of this section.)

(e) Nitric acid of concentration of less than 90 percent in addition to and within limitations of paragraphs (b), (c), and (f) of this section, may be packed in specification containers as follows:

(1) Specification 15A, 15B, 15C, 16A, or 19A (§§ 178.168, 178.169, 178.170, 178.185, 178.190 of this subchapter). Wooden boxes with inside containers which must be glass bottles not over 5 pints capacity each. (See paragraphs (g) and (h) of this section.)

(f) Nitric acid of concentration of 72 percent or less in addition to and within limitations of paragraphs (b) and (e) of this section, may be packed in specification containers as follows:

(1) Spec. 1A, 1C, or 1K (§§ 178.1, 178.3, or 178.14 of this subchapter). Straight sided carboys in boxes or kegs.

(2) Spec. 1X (§ 178.5 of this subchapter). Boxed carboys; single-trip for export only. For shipment by common carriers by water to noncontiguous territories or possessions of the United States and foreign countries; shipments from inland points in the United States which are consigned to such destinations are authorized to be transported to ship side in truckload lots only.

(3) Spec. 1D, or 1E (§ 178.4, or § 178.7 of this subchapter). Glass carboys in boxes or plywood drums of not over 6.5 gallons nominal capacity. Means shall be provided so that accumulated pressure in bottle shall not exceed 10 pounds per square inch gauge at 130° F., or shall vent at a pressure not to exceed 10 pounds per square inch gauge.

(4) Cushioning for carboys must be incombustible mineral material, elastic wooden strips, natural cork blocks or rubber blocks. Other materials may be used if approved by the Bureau of Explosives. The use of hay, excelsior, loose ground cork, or similar materials,

whether treated or untreated, is prohibited.

(5) Spec. 60 (§ 178.255 of this subchapter). Portable tanks, glass-lined.

(6) Spec. 33A (§ 178.150 of this subchapter). Polystyrene cases (nonreusable container) with inside glass bottles not over 5 pints capacity each. Not more than four 5-pint bottles may be packed in one outside container.

(7) Spec. 12R (§ 178.212 of this subchapter). Paper-faced expanded polystyrene board boxes with inside glass bottles not over 5 pints capacity each. Not more than six 5-pint bottles shall be packed in one outside shipping container.

(g) Closures for bottles. Glass stoppers ground to fit and held in place by plaster of Paris covered by a strong cloth securely tied; or:

(1) Threaded-type acid-resistant caps with gasket or lining impervious to the acid and sufficiently resilient, or cushioned, to give an acidproof closure; at least 1 complete continuous thread is required to be engaged when bottle is closed for shipment.

(h) Cushioning inside containers. Inside containers must be well cushioned. Except as provided in subparagraph (1) of this paragraph, all material for cushioning must be incombustible mineral material such as whiting, mineral wool, infusorial earth, asbestos, sifted ashes, etc. The use of hay, excelsior, ground cork, or similar material, whether treated or untreated, is prohibited. Where the cushioning material is very fine or powdery, separate partitions for the individual inside containers shall be provided to prevent the bottles from shifting and coming in contact with each other, and the box must be tight to prevent sifting of cushioning material.

(1) Cushioning of inside containers in outside specification wooden boxes by means of elastic packings, such as wooden strips, large corks, or pads formed of an expanded polystyrene resin that is resistant to the action of nitric acid, fastened securely in position, is authorized if the completed package will pass the swing test prescribed for boxed carboys.

§ 173.269 Perchloric acid.

(a) Perchloric acid in excess of 72 percent must not be shipped. When not exceeding 72 percent strength must be packed in specification containers as follows:

(1) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 178.168, 178.169, 178.170, 178.185, or § 178.190 of this subchapter). Wooden boxes with glass inside containers consisting of glass bottles not over 5 pints capacity each, cushioned with incombustible mineral material in amount sufficient to absorb the acid.

(2) Specification 1A, 1C, 1D, 1E, or 1K (§§ 178.1, 178.3, 178.4, 178.7, 178.14 of this subchapter). Glass carboys in boxes, kegs, or plywood drums.

(3) Spec. 1X (§ 178.5 of this subchapter). Boxed carboys; single-trip for export only. For shipment by common carriers by water to noncontiguous territories or possession of the United States and foreign countries; shipments from inland points in the United States which are consigned to such destinations are authorized to be transported to ship side in truckload lots only.

(4) Spec. 33A (§ 178.150 of this subchapter). Polystyrene cases (nonreusable container) with inside glass bottles not over 5 pints capacity each. Not more than four 5-pint bottles may be packed in one outside container.

(5) Spec. 12R (§ 178.212 of this subchapter). Paper-faced expanded polystyrene board boxes with inside glass bottles not over 5 pints capacity each. Not more than six 5-pint bottles shall be packed in one outside shipping container.

(b) Cushioning for carboys must be incombustible mineral material, elastic wooden strips, natural cork blocks or rubber blocks. Other materials may be used if approved by the Bureau of Explosives. The use of hay, excelsior, loose ground cork, or similar materials, whether treated or untreated, is prohibited.

(c) Perchloric acid in any quantity must not be packed with any other article.

(d) Closures for bottles. Required as follows:

(1) Glass stoppers ground to fit and held in place by plaster of Paris covered by a strong cloth securely tied.

(2) Threaded-type acid-resistant caps with a gasket or lining impervious to the acid and sufficiently resilient, or cushioned, to give an acid-proof closure: at least one complete continuous thread is required to be engaged when bottle is closed for shipment.

(e) Inside containers must be well

cushioned. All material for cushioning must be incombustible mineral material, such as whiting, mineral wool, infusorial earth (kieselguhr), asbestos, sifted ashes, or powdered china clay, etc. The use of hay, excelsior, ground cork, or similar material, either treated or untreated, is prohibited. Where the cushioning material is very fine or powdery, separate partitions for the individual inside containers should be provided to prevent the bottles from shifting and coming in contact with each other, and the box must be tight to prevent sifting of cushioning material.

(1) Cushioning of inside containers in outside wooden boxes by means of elastic packings, such as wooden strips, large corks, or pads formed of an expanded polystyrene resin that is resistant to the action of perchloric acid, fastened securely in position, is authorized if the completed package will pass the swing test prescribed for boxed carboys.

§ 173.270 Phosphorus tribromide.

(a) Phosphorus tribromide must be packed in specification containers as follows:

(1) Spec. 5H (§ 178.87 of this subchapter). Lead-lined metal barrels or drums.

(2) [Reserved]

(3) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 178.168, 178.169, 178.170, 178.185, or 178.190 of this subchapter). Wooden boxes with glass or earthenware inside containers not over 1 gallon each, except that inside containers up to 3 gallons each are authorized when only one is packed in an outside container.

(4) Spec. 28 (§§ 178.8 of this subchapter). Metal-jacketed lead carboys.

(5) Spec. 5K or 5M (§§ 178.88 or 178.90 of this subchapter). Nickel or Monel drums not over 10 gallons capacity each.

§ 173.271 Phosphorus oxybromide, phosphorus oxychloride, phosphorus trichloride, and thiophosphoryl chloride.

(a) Phosphorus oxybromide, phosphorus oxychloride, phosphorus trichloride, and thiophosphoryl chloride must be packed in specification containers as follows:

(1) Spec. 5H (§ 178.87 of this subchapter). Lead-lined metal barrels or drums.

(2) Spec. 5K (§ 178.88 of this subchapter). Nickel drums.

(3) Specification 6D (§ 178.102 of this subchapter). Cylindrical steel overpack with inside Specification 2S or 2SL (§§ 178.35, 178.35a of this subchapter) polyethylene packaging. Polyethylene used must be Type III as set forth in Appendix B—Specifications for Plastics to Part 178 of this Title. Authorized for phosphorus oxychloride and thiophosphoryl chloride only.

(4) Spec. 15A, 15B, 15C, 16A, or 19A 178.190 of this subchapter). Wooden boxes with glass or earthenware inside containers not over 1 gallon each, except that inside containers up to 3 gallons each are authorized when only one is packed in an outside container.

(5) Spec. 28 (§ 178.8 of this subchapter). Metal-jacketed lead carboys.

(6) Spec. 60 (§ 178.255 of this subchapter). Portable tanks when tanks are lead-lined.

(7) [Reserved]

(8) Specification MC 310,¹ MC 311,¹ or MC 312 (§§ 178.340, 178.343). Tank motor vehicles, subject to the following conditions:

(i) Lead-lined or nickel-lined tanks. If nickel-lined, the lining must consist of at least one thirty-second inch of uncontaminated nickel at all points including rivets, welds and other joints, and edges of tank plates.

(ii) Tanks fabricated from Type 316 stainless steel or clad with Type 316 stainless steel having a minimum thickness of 0.2 times the design thickness of the parent metal, are authorized only for phosphorus oxychloride, phosphorus trichloride and thiophosphoryl chloride.

(iii) Tanks made from mild steel or austenitic stainless steel, without lining or cladding. Authorized only for phosphorus trichloride.

(iv) Specification MC 311¹ or MC 312 tank motor vehicles only. Tanks must be constructed of nickel at least 99 percent pure with all cast metal parts of the tank in contact with the lading having a minimum nickel content of approximately 96.7 percent. Authorized only for phosphorus oxychloride and phosphorus trichloride.

(9) [Reserved]

(10) [Reserved]

(11) [Reserved]

(12) Spec. 5A or 5C (§§ 178.81 or 178.83 of this subchapter). Metal barrels or drums. Authorized for phosphorus trichloride and thiophosphoryl chloride.

(13)–(15) [Reserved]

(16) Spec. 17C (§ 178.115 of this subchapter). Metal drums (single-trip) with no opening exceeding 2.3 inches in diameter. When drums are not constructed of stainless steel they must be lined with a material impervious to the lading. Authorized for phosphorus trichloride only.

(17) Spec. 5M (§ 178.90 of this subchapter). Monel drums not over 10 gallons capacity each.

(18) Specification 5B (§ 178.82 of this subchapter). Metal barrels or drums lined with a material which is compatible with the commodity. Authorized for thiophosphoryl chloride only.

§ 173.272 Sulfuric acid.

(a) Sulfuric acid (oleum, oil of vitriol, etc.) must be packed in specification containers as follows:

(b) Limited quantities of sulfuric acid solutions in concentrations of 25 percent or less, in inside packagings of not over 8 fluid ounces capacity each, packed in strong outside packagings and cushioned with absorbent material in sufficient quantity to completely absorb liquid contents in event of breakage, are excepted from labeling and the specification packaging of this subchapter. In addition, shipments are not subject to Part 172 or Part 177 of this subchapter.

(c) Sulfuric acid concentration of 51 percent or less: Authorized packaging is described in subparagraphs (1) through (16) and (23) through (25) of paragraph (i) of this section.

(d) Sulfuric acid concentration of greater than 51 percent to not over 65.25 percent: Authorized packaging is described in subparagraphs (1) through (16).

(e) Sulfuric acid concentration of greater than 65.25 percent to not over 77.5 percent: Authorized packaging is described in subparagraphs (1) through (16) and (20) through (21) of paragraph (i) of this section.

(f) Sulfuric acid concentration of greater than 77.5 percent to not over 95 percent: Authorized packaging is described in subparagraphs (1) through (21) of paragraph (i) of this section.

¹ Use of existing tanks authorized but new construction not authorized.

(g) Sulfuric acid concentration of greater than 95 percent to not over 100.5 percent: Authorized packaging is described in subparagraphs (l) through (4), (6), and (14) through (21) of paragraph (i) of this section.

(h) Sulfuric acid concentration of over 100.5 percent: Authorized packaging is described in subparagraphs (l) through (4), (17), and (19) through (21) of paragraph (i) of this section.

(i) Authorized packagings are described as follows:

(1) Specification 15A, 15B, 15C, 16A, or 19A (§§ 178.168, 178.169, 178.170, 178.185, 178.190 of this subchapter). Wooden boxes with glass inside containers, not over 1 gallon capacity each, except that a glass inside container up to 3 gallons capacity may be used if only one container is packed in each outside wooden box.

(2) Specification 12A (§ 178.210 of this subchapter). Fiberboard boxes with inside glass bottles not over 5 pints capacity each. Not more than six 5-pint glass bottles may be packed in one outside container. Shipper must have established that the completed package meets the test requirements prescribed in § 178.219-10 of this subchapter.

(3) Specification 33A (§ 178.150 of this subchapter). Polystyrene cases (nonreusable container) with inside glass bottles not over 5 pints capacity each. Not more than four 5-pint bottles may be packed in one outside container.

(4) Specification 1X (§ 178.5 of this subchapter). Boxed carboys; single-trip for export only. For shipment by water to noncontiguous territories or possessions of the United States and foreign countries; shipments from inland points in the United States which are consigned to such destinations are authorized to be transported to ship side in truckload lots only.

(5) Specifications 1H, 15P, or 22C (§§ 178.13, 178.182, 178.198 of this subchapter). Metal crate with an inside polyethylene carboy; or glued plywood or wooden box, or plywood drum as prescribed by § 178.198-2(a) of this subchapter with an inside specification 2T or 2TL (§§ 178.21, 178.27 of this subchapter) polyethylene container.

(6) Specification 6D or 37M (non-reusable container (§§ 178.102, 178.134 of this subchapter). Cylindrical steel overpacks with an inside specification 2S, 2SL, or 2T (§§ 178.35, 178.35a, 178.21 of this subchapter) polyethylene container.

Overpack of 30-gallon capacity must be constructed of at least 16-gauge steel throughout when used for sulfuric acid of 93 percent or greater concentration.

(7) Specification 16D (§ 178.187 of this subchapter). Wirebound wooden overwrap, with an inside specification 2T, 2TL, 2S, or 2SL (§§ 178.21, 178.27, 178.35, 178.35a of this subchapter), polyethylene container.

(8) Specification 21P (§ 178.225 of this subchapter). Fiber drum overpack with an inside specification 2T or 2U (§§ 178.21, 178.24 of this subchapter) polyethylene container not over 15-gallon capacity.

(9) Specification 34 (§ 178.19 of this subchapter). Polyethylene container without overpack, not over 30-gallon capacity.

(10) Specification 16A (§ 178.185 of this subchapter). Wirebound wooden box (§ 178.185-22 of this subchapter) with an inside specification 2U (§ 178.24 of this subchapter) polyethylene container. The polyethylene container must be separated from the wooden box by a complete corrugated fiberboard liner and top and bottom pads.

(11) Specification 12P (§ 178.211 of this subchapter). Fiberboard boxes with an inside specification 2U (§ 178.24 of this subchapter) polyethylene container not over 5-gallon capacity each. Wire staples are not authorized for assembly or closure of boxes, except when polyethylene container is completely enclosed in an inside box free of wire staples or other projections that could cause failures.

(12) Specification 12B (§ 178.205 of this subchapter). Fiberboard boxes with inside polyethylene containers or other containers of plastic compatible with the chemical, not over 1-gallon capacity each. Inside containers must be cushioned to prevent movement in the outside box. Not more than four 1-gallon inside containers may be packed in one outside container. Authorized gross weight not over 75 pounds.

(13) Specification 12R (§ 178.212 of this subchapter). Paperfaced expanded polystyrene board boxes with inside specification 2E (§ 178.24a of this subchapter) polyethylene bottles not over 1-gallon capacity each. Not more than four 1-gallon capacity each. Not more than four

1-gallon polyethylene bottles may be packed in one outside packaging.

(14) Specification 12R (§ 178.212 of this subchapter). Paperfaced expanded polystyrene board boxes with inside glass bottles not over 5 pints capacity each. Not more than six 5-pint bottles may be packed in one outside shipping container.

(15) Specification 1A, 1C, or 1K (§§ 178.1, 178.3, 178.14 of this subchapter). Carboys in boxes or kegs.

(16) Specification 1D or 1E (§§ 178.4, 178.7 of this subchapter). Glass carboys in boxes or plywood drums of not over 6.5 gallons nominal capacity.

(17) Specification 5A (§ 178.81 of this subchapter). Metal barrels or drums. Authorized for sulfuric acid of 77.5 percent or greater concentrations, with or without an inhibitor, provided such acid has a corrosive effect on steel no greater than 93.2 percent sulfuric acid, measured at 100° F.

NOTE 1: Tapered steel plugs, without gaskets, for standard specification 5A flanges are authorized. Threaded length must not be less than 1.5 inches. Major diameter of plug must not be over $2\frac{1}{32}$ inches, and minor diameter not less than $2\frac{1}{32}$ inches.

(18) Specification 17F (§ 178.117 of this subchapter). Metal barrels or drums (single-trip only). Drums equipped with vented closures of an experimental type approved by the Bureau of Explosives are also authorized for export shipments. Authorized for sulfuric acid of 77.5 percent to 98 percent concentrations with or without an inhibitor, provided such acid has a corrosive effect on steel no greater than 93.2 percent sulfuric acid, measured at 100° F.

(19) Specification 5C (§ 178.83 of this subchapter). Metal barrels or drums of Type 304, 316, or 347 stainless steel or other types of stainless steel of at least equivalent corrosion resistance and physical properties. Authorized for sulfuric acid of 93 percent or greater concentrations.

(20) Specification 60 (§ 178.255 of this subchapter). Portable tank. Authorized for sulfuric acid of 65.25 percent of greater concentrations provided the corrosive effect in steel is not greater than that of 65.25 percent sulfuric acid, measured at 100° F.

(21) Specification MC 310, MC 311, or MC 312 (§ 178.343 of this subchapter).

Tank motor vehicles. Authorized for sulfuric acid of concentrations 65.25 percent or greater concentrations, provided the corrosive effect in steel is not greater than that of 65.25 percent sulfuric acid, measured at 100° F.

(22) [Reserved]

(23) Specification 5D (§ 178.84 of this subchapter). Rubber-lined metal drums.

(24) Specifications 60 (§ 178.255 of this subchapter). Rubber-lined portable tanks.

(25) Specification MC 310, MC 311, or MC 312 (§ 178.343 of this subchapter). Rubber-lined tank motor vehicles.

§ 173.273 Sulfur trioxide, stabilized.

(a) Sulfur trioxide, stabilized, must be packed in specification containers as follows:

(1) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 178.168, 178.169, 178.170, 178.185, or 178.190 of this subchapter). Wooden boxes with glass or earthenware inside containers not over 1 gallon each.

(2) Spec. 5A or 5C (§§ 178.81 or 178.83 of this subchapter). Metal barrels or drums, not over 55 gallons capacity each.

(3) Spec. 17F (§ 178.117 of this subchapter). Metal drums (single-trip).

(4) [Reserved]

(5) Specifications MC 310, MC 311, or MC 312 (§ 178.343 of this subchapter). Tank motor vehicles. Authorized only for stabilized sulfur trioxide. Tanks must be equipped with spring-relief safety valves. Tanks equipped with interior heater coils not permitted.

§ 173.274 Fluosulfonic acid.

(a) Fluosulfonic acid must be packed in containers as follows:

(1) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 178.168, 178.169, 178.170, 178.185, or 178.190 of this subchapter). Wooden boxes with inside containers which must be not over 1 gallon each, except that inside containers up to 3 gallons are authorized when only one is packed in each outside container, as prescribed in Notes 1 and 2 to this section.

NOTE 1: Bottles manufactured of Pyrex glass or glass of equal acid resistance, authorized only for material containing an excess of sulfur trioxide, with Pyrex glass stoppers, or glass stoppers of equal acid resistance, ground to fit and held in place by plaster of Paris covered by strong cloth securely tied; each bottle must be placed in a metal container, well cushioned therein with incombustible absorbent materials such as mineral

wool, infusorial earth (Kieselguhr), asbestos, etc.

NOTE 2: Or steel containers, 14 gauge steel throughout, welded heads and side seams, equipped with $\frac{3}{4}$ inch welded flange and plug. Threads for plug must be 8 or less per inch. Each drum must be tested for leakage with 15 pounds hydrostatic pressure

(2) Spec. 5A or 17F (single-trip) (§ 178.81 or § 178.117 of this subchapter). Metal barrels or drums not over 55 gallons capacity each.

(3) [Reserved]

(4) Specification MC 310, MC 311, or MC 312 (§ 178.343 of this subchapter). Tank motor vehicles.

§ 173.275 Difluorophosphoric acid, anhydrous, monofluorophosphoric acid, anhydrous, hexafluorophosphoric acid, and mixtures thereof.

(a) Difluorophosphoric acid, anhydrous, monofluorophosphoric acid, anhydrous, hexafluorophosphoric acid, and mixtures thereof must be packed in specification containers as follows:

(1) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 178.168, 178.169, 178.170, 178.185 or § 178.81 or § 178.117 of this subchapter) fiberboard boxes, or spec. 21C (§ 178.224 of this subchapter) fiber drums with inside containers which must be polyethylene, or other nonfragile plastic bottles resistant to the lading, not over 2 gallons capacity each, closed by means of threaded acid-resistant caps; caps must have at least one complete continuous thread and be additionally sealed to the bottle to prevent turning of cap after bottle is closed for shipment.

(2) Spec. 42B, 42C, or 42D (§§ 178.107, 178.108, or 178.109 of this subchapter). Aluminum drums not over 55 gallons capacity.

(3) Spec. 22C (§ 187.198 of this subchapter). Plywood drums as prescribed by § 178.198-2(a) of this subchapter, with inside spec. 2T (§ 178.21 of this subchapter) polyethylene container.

(4) Spec. 60 (§ 178.255 of this subchapter). Portable tanks. Authorized for inhibited acids enumerated in this paragraph only.

(b) Inside containers must be packed so they cannot change position in the outside container while in transit and inert absorbent cushioning material must be used where necessary

§ 173.276 Anhydrous hydrazine and hydrazine solution.

(a) Anhydrous hydrazine and hydrazine solution must be packed in specification containers as follows:

(1) Specification 1D (§ 178.4 of this subchapter). Boxed glass carboys.

(2) Spec. 15A, 15B, or 15C (§§ 178.168, 178.169, or 178.170 of this subchapter). Wooden boxes with inside containers which must consist of glass bottles not exceeding 1-gallon capacity each cushioned by means of vermiculite within tin cans which shall be tightly closed.

(3) Spec. 5, 5A, 5C, or 17E (single-trip) (§§ 178.80, 178.81, 178.83, or 178.116 of this subchapter). Metal barrels or drums which shall be of type 304 or 347 stainless steel, with openings not exceeding 2.3 inches in diameter.

(4) [Reserved]

(5) [Reserved]

(6) Specifications MC 310, MC 311, or MC 312 (§ 178.343 of this subchapter). Tank motor vehicles having tanks of Type 304L or 347 stainless steel with molybdenum content not exceeding one-half of 1 percent. Vapor space in tank must be filled with nitrogen gas at not less than atmospheric pressure.

(7) Spec. 37M (nonreusable container) (§ 178.134 of this subchapter). Cylindrical steel overpack with inside spec. 2SL (§ 178.35a of this subchapter) polyethylene container. Authorized for hydrazine solution only

(8) Spec. 42B, 42C, or 42D (§§ 178.107, 178.108, 178.109 of this subchapter) aluminum drums. Authorized for anhydrous hydrazine only.

§ 173.277 Hypochlorite solutions.

(a) Hypochlorite solutions containing more than 7 percent available chlorine by weight must be packed in specification containers as follows:

(1) Spec. 15A, 15B, 15C or 12B (§§ 178.168, 178.169, 178.170 or 178.205 of this subchapter). Wooden or fiberboard boxes with glass, earthenware, or polyethylene inside containers of not more than 1 gallon capacity each. Packages must not weigh over 65 pounds gross nor contain more than 4 glass or earthenware inside containers if their capacity is greater than 5 pints each, or more

than six such inside polyethylene containers.

(2) Specification 1A, 1C, 1D, or 1E (§§ 178.1, 178.3, 178.4, 178.7 of this subchapter). Glass carboys in boxes, kegs or plywood drums.

(3) Spec. 1H, 15P, or 22C (§§ 178.13, 178.182, or 178.198 of this subchapter). Metal crate with inside polyethylene carboy; or glued plywood or wooden box, or plywood drum as prescribed by § 178.198-2(a) of this subchapter, with inside spec. 2T (§ 178.21 of this subchapter) polyethylene container. Spec. 15P glued plywood or wooden box may contain spec. 2S (§ 178.35 of this subchapter) polyethylene drum. Authorized for not over 16 percent sodium hypochlorite solution only.

(4) Specification 6D or 37M (nonreusable container) (§§ 178.102, 178.134 of this subchapter). Cylindrical steel overpacks with inside specification 2S or 2SL (§§ 178.35, 178.35a of this subchapter) polyethylene liners. Authorized for not over 16 percent sodium hypochlorite solution only.

(5) Specification 12P (§ 178.211 of this subchapter). Fiberboard boxes with inside specification 2U (§ 178.24 of this subchapter) polyethylene container not over 5 gallons capacity each. Wire staples are not authorized for assembly or closure of boxes, except when polyethylene container is completely enclosed in inside boxes free of wire staples or other projections that could cause failures.

(6) Spec. 34 (§ 178.19 of this subchapter). Polyethylene container without overpack, not over 30-gallons capacity. Authorized for not over 16 percent sodium hypochlorite solution only.

(7) Specification 21P (§ 178.225 of this subchapter). Fiber drum overpack with inside Specifications 2S, 2SL, 2T, or 2U (§§ 178.35, 178.35a, 178.21, 178.24 of this subchapter) polyethylene container. Authorized for not over 16 percent sodium hypochlorite solutions only.

(b) Closures for inside containers and carboys must be vented and must be of a material resistant to the lading and capable of preventing leakage of liquid contents.

(c) [Reserved]

(d) Limited quantities of this material in glass inside packaging of not more than 4 fluid ounces capacity each, packed in

strong outside packaging, and cushioned with absorbent material in sufficient quantity to completely absorb liquid contents in the event of breakage, are excepted from labeling and the specification packaging requirements of this subchapter.

(1) Polyethylene pouches not over 2 1/2 ounces capacity each, heat sealed, and formed of polyethylene, or other suitable plastic, not less than .0035 inch in thickness to which shall be laminated a .0015 inch, 25-pound basis weight white sulphate paper, when securely packed not more than 144 pouches in a strong fiberboard box (absorbent cushioning material not required), are exempt from Part 172 and Part 177 of this subchapter.

(e) Limited quantities of this material in polyethylene pouches not over 2 1/2 ounces capacity each, heat sealed, and formed of polyethylene, or other suitable plastic, not less than 0.0035-inch in thickness to which must be laminated a 0.0015-inch, 25-pound basis weight white sulphate paper, when securely packed not more than 144 pouches in a strong fiberboard box, are excepted from labeling and the specification packaging requirements, of this subchapter. In addition, shipments are not subject to Part 172 or Part 177 of this subchapter.

(f) Special exceptions for shipment of certain hypochlorite solutions in the ORM-D class are provided in Subpart N of this part.

(g) Shipments by tank motor vehicle are not subject to any requirements of this subchapter.

§ 173.278 Nitrohydrochloric acid.

(a) Nitrohydrochloric acid, which is a mixture of nitric acid not over 1.42 specific gravity and hydrochloric acid not over 1.19 specific gravity in the approximate proportions of one part nitric acid and three parts hydrochloric acid, must be packed in specification containers as follows:

(1) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 178.168, 178.169, 178.170, 178.185, or 178.190 of this subchapter). Wooden boxes with glass inside containers of not over 5 pints capacity each, individually inclosed in tightly closed metal cans and cushioned therein with sufficient incombustible mineral material.

(b) Nitrohydrochloric acid diluted, is a solution of nitrohydrochloric acid as described in paragraph (a) of this sec-

tion, which has been diluted to not less than five times the volume of water and must be packed in specification containers as follows:

(1) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 178.168, 178.169, 178.170, 178.185, or 178.190 of this subchapter). Wooden boxes with glass inside containers of not over 5 pints capacity each, individually inclosed in tightly closed metal cans and cushioned therein with sufficient incombustible mineral material.

(2) Specification 1A, 1D, or 1E (§§ 178.1, 178.4, 178.7 of this subchapter). Glass carboys in boxes or plywood drums, not over 5 gallons nominal capacity for specification 1A and not over 6.5 gallons nominal capacity for specifications 1D and 1E.

§ 173.279 Anisoyl chloride.

(a) Anisoyl chloride must be packed in specification containers as follows:

(1) Spec. 5C (§ 178.83 of this subchapter). Metal barrels or drums.

(2) Spec. 5 (§ 178.80 of this subchapter). Metal barrels or drums of stainless steel only, with flanges for closures welded in place and having no opening exceeding 2.3 inches in diameter.

(b) Limited quantities of this material in inside packagings of not over 8 fluid ounces capacity each, packed in strong outside packaging, and cushioned with absorbent material in sufficient quantity to completely absorb liquid contents in the event of breakage, are excepted from labeling and specification packaging requirements of this subchapter. In addition, shipments are not subject to Part 172 or Part 177 of this subchapter.

§ 173.280 Trichlorosilanes.

(a) Allyl trichlorosilane, amyl trichlorosilane, butyl trichlorosilane, chlorophenyl trichlorosilane, cyclohexenyl trichlorosilane, cyclohexyl trichlorosilane, dichlorophenyl trichlorosilane, diphenyl dichlorosilane, dodecyl trichlorosilane, ethyl phenyl dichlorosilane, hexadecyl trichlorosilane, hexyl trichlorosilane, nonyl trichlorosilane, octadecyl trichlorosilane, octyl trichlorosilane, phenyl trichlorosilane, and propyl trichlorosilane must be packaged as follows:

(1) Spec. 15A or 16B (§§ 178.168 or 178.186 of this subchapter). Wooden boxes with glass inside containers not over 1 gallon capacity each securely closed and cushioned with incombustible

absorbent material.

(2) Spec. 17H or 37A (§ 178.118 or 178.131 of this subchapter). Metal drums (single-trip), with glass inside containers not over 1 gallon capacity each securely closed and cushioned with incombustible absorbent material.

(3) Spec. 5A (§ 178.81 of this subchapter). Metal drums not over 55 gallons capacity.

(4) Spec. 5F (§ 178.85 of this subchapter). Metal drums not over 11 gallons capacity.

(5) Specification 5, 5B, 5C, and 17E single-trip (§§ 178.80, 178.82, 178.83, 178.116 of this subchapter). Metal drums.

(6) Specification cylinders as prescribed for any compressed gas, except acetylene.

(7) [Reserved]

(8) Specifications MC 310, MC 311, or MC 312 (§ 178.343 of this subchapter). Tank motor vehicles of steel or stainless steel construction.

§ 173.281 Benzyl bromide (bromotoluene, alpha).

(a) Benzyl bromide (bromotoluene, alpha) must be packed in specification containers as follows:

(1) Spec. 15A, 15B, or 15C (§§ 178.168, 178.169, and 178.170 of this subchapter). Wooden boxes with inside containers which must be glass bottles, not over 1-gallon capacity each, closed by means of screw caps which are resistant to action of the contents; bottles must be packed in metal cans having slip-on or friction closure; cans must be cushioned in outside boxes with incombustible material.

(2) Spec. 5K or 5M (§ 178.88 or 178.90 of this subchapter). Nickel or monel barrels or drums. Spec. 5M drums shall not be over 10 gallons capacity.

§ 173.282 Isopropyl percarbonate, stabilized.

(a) Isopropyl percarbonate, stabilized, must be packed in specification containers as follows:

(1) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 178.168, 178.169, 178.170, 178.185, or 178.190 of this subchapter). Wooden boxes with glass or earthenware inside containers of not over 2 gallons capacity each which must be maintained at a temperature below 75° F. Shipments are authorized for transportation by private or contract carrier by motor vehicle only.

§ 173.283 Fluoboric acid.

(a) Fluoboric acid exceeding 50 percent concentration must be packed as prescribed in § 173.264(a) for hydrofluoric acid.

(b) Fluoboric acid of 50 percent concentration or less must be packed as follows:

(1) In specification packaging as prescribed in paragraph (a) of this section.

(2) In specification packaging as prescribed in § 173.245(a) (12), (16), (18), (19), (21), (24), and (26).

§ 173.284 [Reserved]

§ 173.285 [Reserved]

§ 173.286 Chemical kits.

(a) Chemical kits, except as otherwise provided in this subchapter, must be packed, marked, and labeled as prescribed by this part for the specific corrosive materials contained therein.

(b) Chemical kits containing limited quantities of corrosive liquids in inside packagings of not over 6 fluid ounces capacity each are excepted from labeling and the specification packaging requirements of this subchapter if all of the following requirements are complied with. In addition, shipments are not subject to Part 172 or Part 177 of this subchapter.

(1) The kit may not contain any corrosive liquid for which no exemption from packaging requirements of this Part 173 is permitted by the commodity list in § 172.5(a) of this subchapter.

(2) The kit must be a strong wooden or metal container, or must be packed in a strong wooden or metal container.

(3) The corrosive liquids must be cushioned with sufficient absorbent cushioning material to completely absorb the contents of the individual containers, and must be protected from injury by other materials in the kit.

(4) The contents of the kit must be of a nature and packed so there will be no possibility of the mixture of contents causing dangerous evolution of heat or gas.

(c) Chemical kits containing corrosive liquids and other chemicals not classed as hazardous materials used for photographic processing, except as otherwise provided for in this subchapter, must be packed in specification containers as follows:

(1) Spec. 12A (§ 178.210 of this subchapter). Fiberboard boxes with inside

glass bottles not over 32 ounces capacity each, securely cushioned and separated from other inside containers. The contents of the kit must be of such nature and so packed that there will be no possibility of the mixture of contents causing dangerous evolution of heat or gas. Shipper must have established that the completed package meets test requirements prescribed by § 178.210-10 of this subchapter.

§ 173.287 Chromic acid solution.

(a) For the purposes of the regulations in this part, a chromic acid solution is a solution of chromic acid (chromium trioxide) in water, with or without other acids, containing 35 percent or more of chromic acid by weight. (For solutions containing less than 35 percent chromic acid, see paragraph (c) of this section.) Packagings authorized must be of a design and be constructed of materials that will not react dangerously with or be decomposed by the chemical solution packaged therein.

(b) Chromic acid solutions must be packaged in specification containers as follows:

(1) Specification 1A (§ 178.1 of this subchapter), Glass carboy in a box.

(2) Specifications 5, 5A, 5B (§§ 178.80, 178.81, 178.82 of this subchapter). Metal barrel or drum with openings not exceeding 2.3 inches in diameter. Authorized for solutions containing chromic acid only.

(3) Specification 17E (§ 178.116 of this subchapter) steel drum. Authorized for solutions containing chromic acid only.

(4) Specification 12A or 12B (§§ 178.210, 178.205 of this subchapter). Fiberboard box with one inside glass container not over 4 fluid ounces capacity, packed in a wax-lined cylindrical fiber carton with metal ends. The bottle closure must consist of a tightly secured, fitted, ground glass stopper. Space must remain between the bottle and the inner surface of the fiber cylinder and must be filled with closely packed asbestos in sufficient quantity to completely absorb the contents of the bottle in the event of breakage. Not authorized for solutions containing nitric acid.

(5) Specification 12R (§ 178.212 of this subchapter). Paper-faced expanded polystyrene board box with inside glass bottles not over 5 pints capacity each. Not more than six 5-pint bottles may be packaged in one box. Each bottle must be well cushioned. Partitioning and cushioning must be provided to prevent bottles from shifting, or coming in contact with each other, the box wall, or the bottom. Each bottle closure must consist of a tightly secured, fitted, ground glass stopper, or a threaded-type, acid-resistant cap with a gasket or lining impervious to the acid, sufficiently resilient or cushioned to give an acid-proof, leakproof closure.

(6) Specification 33A (§ 178.150 of this subchapter). Polystyrene case (nonreusable container) with inside glass bottles not over 5 pints capacity each. Not more than four 5-pint bottles may be packaged in one outside container. Each bottle closure must consist of a tightly secured, fitted, ground glass stopper, or a threaded-type, acid-resistant cap with a gasket or lining impervious to the acid, sufficiently resilient or cushioned to give an acidproof, leakproof closure.

(7) Specification 29 (§ 178.226 of this subchapter). Mailing tube with glass bottles not over 1 ounce capacity each. Each bottle must be well cushioned. Partitioning and cushioning must be provided to prevent bottles from shifting or coming in contact with each other or the tube wall, bottom, or top.

(c) Solutions containing chromic acid in water in concentration not exceeding 35 percent by weight, with or without other acids, and which are not otherwise regulated by Subpart E of this part, must be described as "Corrosive liquids, n.o.s." In addition to the packaging and the limitations prescribed therefor in paragraph (b) of this section, solutions of this composition may also be packaged as follows:

(1) In packaging as prescribed in § 173.245, except (a) (4), (14), (15), (18), (19), and (24).

(2) Specification 21P (§ 178.225 of this subchapter). Fiber drum overpack with inside specification 2S or 2SL (§§ 178.35, 178.35a of this subchapter) polyethylene container.

(3) Specifications 5, 5A, 5B (§§ 178.80, 178.81, 178.82 of this subchapter). Metal barrel or drum with openings not ex-

ceeding 2.3 inches in diameter. Authorized for solutions containing chromic acid only.

(4) Specification 17E (§ 178.116 of this subchapter) steel drum. Authorized for solutions containing chromic acid only.

§ 173.288 Chloroformates.

(a) Allyl chloroformate, benzyl chloroformate, ethyl chloroformate, and methyl chloroformate must be packaged as follows:

(1) Spec. 15A, 15B, or 15C (§§ 178.168, 178.169, or 178.170 of this subchapter). Wooden boxes with glass inside containers not over 1 pint each, cushioned with incombustible mineral material.

(2) Specification 1A (§ 178.1 of this subchapter). Boxed carboys. Glass bottles having nominal capacity of 3 gallons also authorized when packed and tested in accordance with requirements of specification 1A (§ 178.1 of this subchapter); necks must be protected during shipment.

(b) Allyl chloroformate may, in addition, be packed in specification 5H (§ 178.87 of this subchapter) lead-lined metal drums not over 55 gallons capacity.

(c) Spec. 16D (§ 178.187 of this subchapter). Wooden wirebound overwrap having one inside spec. 2SL (§ 178.35a of this subchapter) polyethylene container not over 55 gallons capacity. Authorized for ethyl chloroformate or methyl chloroformate only.

(d) Specification 6D or 37M (§§ 178.102, 178.134 of this subchapter). Cylindrical steel overpack with inside Specifications 2S, 2SL, or 2T (§§ 178.35, 178.35a, 178.21 of this subchapter) polyethylene container. Authorized for ethyl chloroformate and methyl chloroformate only.

(e) Specification 34 (§ 178.19 of this subchapter). Polyethylene container without overpack, not over 5 gallons capacity.

§ 173.289 Formic acid and formic acid solutions.

(a) Formic acid and formic acid solutions must be packed in specification containers as follows:

(1) In containers prescribed in § 173.245, except spec. 5A, 17C, 17E or 17F (§§ 178.81, 178.115, 178.116 or 178.117 of this subchapter). Metal barrels or drums.

(2) [Reserved]

(3) [Reserved]

(4) Specifications MC 310, MC 311, or MC 312 (§ 178.343 of this subchapter). Tank motor vehicles.

(5) Spec. 5C (§ 178.83 of this subchapter). Metal barrels or drums.

(6) Spec. 5 (§ 178.80 of this subchapter). Metal barrels or drums of stainless steel only, with flanges for closures welded in place and having no opening exceeding 2.3 inches in diameter.

(7) Specification 17H (§ 178.118 of this subchapter). Metal drums (single-trip) equipped with bag type liners of material and construction approved by the Department. Each drum must have two diametrically opposite vent holes $\frac{1}{4}$ inch diameter in the side wall at each end in close proximity to the top curl and bottom chime. Interior of welded side seam must be covered or otherwise treated to provide a nonabrasive surface.

(8) Spec. 60 (§ 178.255 of this subchapter). Portable tanks, marked "FOR FORMIC ACID ONLY".

(9) Specification 1EX (§ 178.6 of this subchapter). Carboys in plywood drums.

(10) Spec. 1H (§ 178.13 of this subchapter). Metal crate with inside polyethylene carboy.

§ 173.290 Mixtures of hydrofluoric and sulfuric acid.

(a) Mixtures of hydrofluoric acid and sulfuric acid, containing not more than 80 percent by weight and not less than 70 percent by weight of hydrofluoric acid and sulfuric acid combined, with the hydrofluoric acid content not less than 25 percent by weight in any case, must be packed in specification containers as follows:

(1) Spec. 5A (§ 178.81 of this subchapter). Unlined metal barrels or drums which have been subjected to an adequate passivation or neutralization process (see Note 1). Containers must be filled to not over 80 percent of capacity at 68° F. If containers are washed out with water, they must be repassivated before shipment.

NOTE 1: Each metal container, before being put into this service, must be passivated by the following or an equally efficient method: By filling drum to 90 percent of capacity with hydrofluoric acid of 58 percent strength and allowing drum to stand 48 hours at a temperature of 80° F., and then 7 hours at 140° F., the internal pressure maintained at atmospheric pressure by means of a ventilated bung.

(2) Containers not exceeding 55 gallons capacity each are authorized for truckload, and less-than-truckload shipment. Containers exceeding 55 gallons capacity each are authorized for truckload shipments only but they must be loaded by consignor and unloaded by consignee.

(3) For less-than-truckload shipments, containers must be of metal at least as heavy as 14 gauge United States standard for not over 20 gallons capacity each or 12 gauge for not over 55 gallons capacity each. Each container must be subjected to at least one of the following tests before shipment: By interior pressure of at least 15 pounds per square inch before filling or by holding for inspection for at least 24 hours after filling. In either case, each container must be vented prior to shipment.

§ 173.291 Flame retardant compound, liquid.

(a) Flame retardant compound, liquid, must be packaged as follows:

(1) Specification 1A, 1B, or 1C (§§ 178.1, 178.2, 178.3 of this subchapter). Carboys in boxes or kegs which must be closed, and when reused must be reconditioned and tested, as provided in the specifications.

(2) Specification 1D or 1E (§§ 178.4, 178.7 of this subchapter). Glass carboys in boxes or plywood drums of not over 6.5 gallons nominal capacity. Means must be provided so that accumulated pressure in bottle may not exceed 10 pounds per square inch gauge at 130° F. (55° C.), or will vent at a pressure not to exceed 10 psig.

(3) Spec. 1X (§ 178.5 of this subchapter). Boxed carboys; single-trip for export only. For shipment by common carriers by water to noncontiguous territories or possessions of the United States and foreign countries; shipments from inland points in the United States which are consigned to such destinations are authorized to be transported to ship side in truckload lots only.

(4) [Reserved]

(5) [Reserved]

(6) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 178.168, 178.169, 178.170, 178.185, or 178.190 of this subchapter). Wooden boxes with inside containers which must be glass or earthenware, not over 1 gallon each, except that inside containers up to 3 gallons are authorized when only one is packed in each outside container.

(7) Spec. 28 (§ 178.8 of this subchapter). Metal-jacketed lead carboys.

§ 173.292 Hexamethylene diamine solution.

(a) Hexamethylene diamine solution must be packed in specification containers as follows:

(1) In containers prescribed in § 173.249.

(2) Specifications MC 300, MC 301, MC 302, MC 303, MC 304, MC 305, MC 306, MC 307, MC 310, MC 311, or MC 312 (§§ 178.341, 178.342, 178.343 of this subchapter). Tank motor vehicles.

§ 173.293 Iodine monochloride.

(a) Iodine monochloride must be packed in specification containers as follows:

(1) Spec. 15A or 15B (§ 178.168 or § 178.169 of this subchapter). Wooden boxes with inside containers not over 1 quart capacity each; or with stone or earthenware jugs not over 1 gallon capacity each.

(b) Outage (vacant space above liquid) for inside containers must be not less than 15 percent.

(c) Inside containers must be securely closed by hermetical sealing or by glass or stone stoppers ground to fit and securely fastened or by screw caps fitted with gaskets of suitable material resistant to the contents.

(d) Inside containers must be securely cushioned on all sides with incombustible cushioning material which will not produce heat when in contact with iodine monochloride.

§ 173.294 Monochloroacetic acid, liquid or solution.

(a) Monochloroacetic acid, liquid or solution, must be packed in specification containers as follows:

(1) In containers prescribed in § 173.245 (a) (1), (2), (3), (6), or (7).

(2) [Reserved]

(3) Specifications MC 310, MC 311, or MC 312 (§ 178.343 of this subchapter). Tank motor vehicles. Tanks to be fabricated from 99 percent pure nickel plates, Type 304 or 316 stainless steel, or be suitably lined.

§ 173.295 Benzyl chloride.

(a) Benzyl chloride must be packed in specification containers as follows:

(1) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 178.168, 178.169, 178.170, 178.185 or 178.190 of this subchapter). Wooden boxes with glass or earthenware inside containers not over 1 gallon each, except that inside containers up to 3 gallons each are authorized when only one is packed in an outside container.

(2) [Reserved]

(3) Specification 1A, 1C, 1D, or 1E (§§ 178.1, 178.3, 178.4, 178.7 of this subchapter). Glass carboys in boxes, kegs or plywood drums.

(4) Spec. 1X (§ 178.5 of this subchapter). Boxed carboys; single-trip for export only. For shipment by common carriers by water to noncontiguous territories or possessions of the United States and foreign countries; shipments from inland points in the United States which are consigned to such destinations are author-

ized to be transported to ship side in truckload lots only.

(5) Spec. 5A or 17C (single-trip) (§§ 178.81 or 178.115 of this subchapter). Metal barrels or drums with openings not exceeding 2.3 inches in diameter. Authorized for stabilized benzyl chloride only.

(6) Spec. 5K (§ 178.88 of this subchapter). Nickel drums. When shipped in unstabilized condition, the lading must be anhydrous and must be free from impurities such as iron.

(7) Spec. 5H (§ 178.87 of this subchapter). Metal barrels or drums, lead-lined.

(8) Spec. 60 (§ 178.255 of this chapter). Portable tanks. Benzyl chloride must be stabilized when loaded in unlined tanks.

(9) Specifications MC 310, MC 311, or MC 312 (§ 178.343 of this subchapter). Tank motor vehicles. Authorized for stabilized benzyl chloride only.

(10) Specifications MC 310, MC 311, or MC 312 (§ 178.343 of this subchapter). Tank motor vehicles fabricated from 99 percent pure nickel plates. All cast metal parts of the tank in contact with the lading must have a minimum nickel content of 96.7 percent. When shipped in unstabilized condition, the lading must be anhydrous and must be free from impurities such as iron.

§ 173.296 Di iso octyl acid phosphate.

(a) Di iso octyl acid phosphate must be packed in specification containers as follows:

(1) Spec. 17E (§ 178.116 of this subchapter). Metal drums (single-trip) with openings not exceeding 2.3 inches in diameter.

(2) Specifications MC 310, MC 311, or MC 312 (§ 178.343 of this subchapter). Tank motor vehicles.

§ 173.297 Titanium sulfate solution containing not more than 45 percent sulfuric acid.

(a) Titanium sulfate solution containing not more than 45 percent sulfuric acid must be packed in specification containers as follows:

(1) Specifications MC 310, MC 311, or MC 312 (§ 178.343 of this subchapter). Tank motor vehicles, rubber-lined.

(2) [Reserved]

(3) Spec. 15A, 15B, 15C, 16A or 19A (§§ 178.168, 178.169, 178.170, 178.185 or § 178.190 of this subchapter). Wooden boxes with inside glass or earthenware containers, not over 1 gallon capacity each.

(4) Specification 6D (§ 178.102 of this subchapter). Cylindrical steel overpack with inside specification 2S (§ 178.35 of this subchapter) polyethylene container not over 30-gallons capacity. Overpack of over 15 gallons must be constructed of at least 18-gauge steel throughout.

§ 173.298 Memtetrahydro phthalic anhydride.

(a) Memtetrahydro phthalic anhydride must be packed in specification containers as follows:

(1) Spec. 15A, 15B, 15C, 16A or 19A (§§ 178.168, 178.169, 178.170, 178.185 or § 178.190 of this subchapter). Wooden boxes with inside glass containers not over 1-gallon capacity each.

(2) Spec. 12A (§ 178.210 of this subchapter). Fiberboard boxes with inside glass bottles not over 1-gallon capacity each. Not more than 4 inside glass bottles exceeding 5 pints capacity each shall be packed in the outside container. Shipper must have established that the completed package meets test requirements prescribed by § 178.210-10 of this subchapter.

(3) Spec. 17E (§ 178.116 of this subchapter). Metal drums (single-trip) with openings not exceeding 2.3 inches in diameter.

(4) Specification 37P (§ 178.133 of this subchapter). Steel drums with polyethylene liner (non-reusable container). Authorized only for materials that will not react with polyethylene and result in a packaging failure.

§ 173.299 Etching acid liquid, n.o.s.

(a) Etching acid liquid shall be a mixture of nitric acid, hydrofluoric acid, having nitric acid in concentrations of not more than 60 percent by weight, hydrofluoric acid in concentrations of not less than 4 percent by weight and water not less than 24 percent by weight, and may contain acetic acid. These mixtures must be packed in specification containers as follows:

(1) Specification 12A (§ 178.210 of this subchapter). Fiberboard boxes with Specification 2E (§ 178.24a of this subchapter) inside polyethylene bottles hav-

ing a minimum wall thickness of 0.030 inch and screw-cap closures. Net weight per bottle may not be over 10 pounds each. The net weight per package may not be more than 40 pounds.

(2) Specification 6D or 37M (non-reusable) (§§ 178.102, 178.134 of this subchapter). Cylindrical steel overpack with inside Specification 2S or 2SL (§§ 178.35, 178.35a of this subchapter) polyethylene container not over 55-gallon capacity. Specification 37M overpack of over 30-gallon capacity must be constructed of at least 20-gauge steel throughout.

(b) All outside shipping containers must be plainly marked "NONREUSABLE CONTAINERS." No components of the package may be reused.

§ 173.299a Tris-(1-aziridinyl) phosphine oxide.

(a) Tris-(1-aziridinyl) phosphine oxide must be packed in specification containers as follows:

(1) In containers as prescribed in § 173.245, not over 5 gallons capacity each.

Subpart G—Compressed Gases; Definition and Preparation

§ 173.300 Definitions.

For the purpose of this subchapter, the following terminology is defined:

(a) Compressed gas. The term "compressed gas" shall designate any material or mixture having in the container an absolute pressure exceeding 40 p.s.i. at 70° F. or, regardless of the pressure at 70° F., having an absolute pressure exceeding 104 p.s.i. at 130° F.; or any liquid flammable material having a vapor pressure exceeding 40 p.s.i. absolute at 100° F. as determined by ASTM Test D-323.

(b) Flammable compressed gas. Any compressed gas as defined in paragraph (a) of this section shall be classed as "flammable gas" if any one of the following occurs:

(1) Either a mixture of 13 percent or less (by volume) with air forms a flammable mixture or the flammable range with air is wider than 12 percent regardless of the lower limit. These limits shall be determined at atmospheric temperature and pressure. The method of sampling and test procedure shall be acceptable to the

Bureau of Explosives.

(2) Using the Bureau of Explosives' Flame Projection Apparatus (see Note 1), the flame projects more than 18 inches beyond the ignition source with valve opened fully, or, the flame flashes back and burns at the valve with any degree of valve opening.

(3) Using the Bureau of Explosives' Open Drum Apparatus (see Note 1), there is any significant propagation of flame away from the ignition source.

(4) Using the Bureau of Explosives' Closed Drum Apparatus (see Note 1), there is any explosion of the vapor-air mixture in the drum.

NOTE 1: A description of the Bureau of Explosives' Flame Projection Apparatus, Open Drum Apparatus, Closed Drum Apparatus, and method of tests may be procured from the Bureau of Explosives.

(c) Non-liquefied compressed gas. A "non-liquefied compressed gas" is a gas, other than gas in solution, which under the charged pressure is entirely gaseous at a temperature of 70° F.

(d) Liquefied compressed gas. A "liquefied compressed gas" is a gas which, under the charged pressure, is partially liquid at a temperature of 70° F.

(e) Compressed gas in solution. A "compressed gas in solution" is a non-liquefied compressed gas which is dissolved in a solvent.

(f) Flammable range. The term "flammable range" shall designate the difference between the minimum and maximum volume percentages of the material in air that forms a flammable compressed gas.

(g) Filling density. The term "filling density" shall designate the percent ratio of the weight of gas in a container to the weight of water that the container will hold at 60° F. (One pound of water equals 27.737 cubic inches at 60° F.) For example, for a liquefied petroleum gas of 0.504/0.510 specific gravity, a 100-pound cylinder holds 238.1 pounds of water and the filling density is 42 percent; therefore the amount of gas permitted is 0.42X238.1 or 100 pounds.

(h) Service pressure. The term "service pressure" shall designate the authorized pressure marking on the container. For example, for cylinders marked "DOT 3A1800", the service pressure is 1800 psig (pounds per square inch gauge).

§ 173.300a [Reserved]

§ 173.300b [Reserved]

§ 173.300c [Reserved]

§ 173.301 General requirements for shipment of compressed gases in cylinders.¹

(a) *Gases capable of combining chemically.* A cylinder charged with compressed gas must not contain gases or materials that are capable of combining chemically with each other or with the cylinder material so as to endanger its serviceability. See § 173.34(e)(16) regarding the requalification of a cylinder that previously contained a corrosive liquid.

(b) *Ownership of container.* A container charged with a compressed gas must not be shipped unless it was charged by or with the consent of the owner of the container.

(c) *Retest of container.* A container for which prescribed periodic retest has become due must not be charged and shipped until such retest has been properly made.

(d) *Manifolding containers in transportation.* No means of interconnecting such as manifolding of individual containers may be employed for the transportation of compressed gases, except as hereinafter authorized. Containers so manifolded shall be supported and held together as a unit by structurally adequate means. Safety relief devices on manifolded horizontal containers charged with flammable compressed gas shall be arranged to discharge upward and unobstructed to the open air in such a manner as to prevent any impingement of escaping gas upon the containers.

(1) Manifolding is authorized for containers of the following gases: Argon, air, carbon dioxide, helium, neon, nitrogen, nitrous oxide or oxygen provided that each container is individually equipped with safety relief devices as required by § 173.34(d) or § 173.315(i).

tainers of the following gases: Argon, (2) Manifolding is authorized for cylinders of the following nonliquefied gases: Boron trifluoride, carbon monoxide, ethylene, hydrogen, hydrocarbon gases, methane, and nitrogen tri-

fluoride, provided individual cylinders are equipped with approved safety relief devices as required by § 173.34(d) or § 173.315(i): *And provided further,* That each cylinder is equipped with individual shutoff valve, or valves, that must be tightly closed while in transit. Manifold branch lines to these and individual shutoff valves must be sufficiently flexible to prevent injury to the valves which otherwise might result from the use of rigid branch lines. A temperature measuring device may be inserted in one cylinder of a manifold installation in place of the shutoff valve.

(3) Manifolding is authorized for containers of the following gases: Ethane, ethylene, liquefied hydrocarbon gas, hydrogen chloride (anhydrous), liquefied petroleum gas and propylene provided each container is equipped with approved safety relief devices as required by § 173.34(d) or § 173.315(i): *And provided further,* That each container is equipped with an individual shutoff valve, or valves, that must be tightly closed while in transit. Each container must be separately charged and means must be provided to insure that no interchange of container contents can occur during transportation. Manifolded branch lines to these individual shutoff valves must be sufficiently flexible to prevent injury to the valves which otherwise might result from the use of rigid branch lines.

(4) Manifolding is authorized for containers of acetylene, provided that each container is individually equipped with approved safety relief devices as required by § 173.34(d), and further provided that each container is equipped with an individual shutoff valve, or valves, which shall be tightly closed while in transit. Manifold branch lines to these individual shutoff valves shall be sufficiently flexible to prevent injury to the valves which otherwise might result from the use of rigid branch lines. All manifold containers shall be transported in a vertical position. For the checking of tare weights or for replacement of solvent the container shall be removed from the manifold. This requirement is not intended to prohibit the charging of the acetylene cylinders while manifolded.

(5) Manifolding is authorized for cargo tanks of the following gas provided individual cargo tanks are equipped with the safety relief valves and gauging de-

¹ Requirements covering cylinders are also applicable to spherical pressure vessels.

vices, as required by § 173.315 (h) and (i); and further provided, that each cargo tank is equipped with individual valve, or valves, which shall be tightly closed while in transit and that each such container must be separately charged: Anhydrous ammonia.

(e) *Container pressure.* The pressure in the container at 70° F. must not exceed the service pressure for which the container is marked or designated, except as provided in § 173.302(c).

NOTE 1: In certain cases with liquefied gases the pressure at 70° F. must be lower than the marked service pressure to avoid having a greater pressure at a temperature of 130° F. than is permitted.

(1) For authorized containers not marked with a service pressure, the service pressure is designated as follows:

Specification marking	Service pressure—psig
DOT 3.....	1,800
3E.....	1,800
4.....	300
8.....	250
9.....	200
25.....	300
33.....	480
38.....	250
40.....	200
41.....	240

(2) For containers made prior to the effective date of specifications, the service pressure is designated as the same as for the same type of container made in accordance with current specifications.

(f) *Container pressure at 130° F.* The pressure in the container at 130° F. shall not exceed 5/4 times the service pressure, except:

(1) Containers charged with acetylene, liquefied nitrous oxide and liquefied carbon dioxide.

(2) When a cylinder is charged in accordance with § 173.302(c), the pressure in the cylinder at 130° F. must not exceed 5/4 times the filling pressure authorized therein.

(g) *Container valve protection.* Containers charged with flammable, corrosive, or noxious gases, must have their valves protected by one of the following methods.

(1) By equipping the containers with securely attached metal caps of sufficient strength to protect the valves from injury during transit.

(2) By boxing or crating the containers so as to give proper protection to the valves.

(3) By so constructing the containers that the valve is recessed into the container or otherwise protected so that it will not be subjected to a blow when the container is dropped on a flat surface.

(4) By loading the containers compactly in an upright position and securely bracing in cars or motor vehicles, when loaded by the consignor and to be unloaded by the consignee.

(5) By equipping with valves strong enough to avoid injury during transit for containers containing non-liquefied gas under pressure not exceeding 300 psi at 70° F.

(h) *Compressed gas containers.* Compressed gases must be in metal containers built in accordance with the DOT specifications, as shown below, in effect at the time of manufacture, and marked as required by the specification and the regulation for retesting if applicable;

CONTAINERS

DOT-2P.....	DOT-3D.....	DOT-4BW.....	DOT-8AL.....
2Q.....	3E.....	4B240ET.....	9.....
ICC-3 ¹	3HT.....	4C.....	ICC-25. ¹
DOT-3A.....	DOT-3T.....	4D.....	26. ¹
DOT-3AX.....	4.....	4DA.....	32. ¹
3A48OX.....	4A.....	4DS.....	38. ¹
3AA.....	4AA.....	4E.....	DOT-39.....
DOT-3AAX.....	4B.....	4L.....	40.....
3B.....	4B240FLW.....	5.....	41.....
3BN.....	4B240X.....	5F.....	
3C.....	4BA.....	8.....	

¹ Use of existing cylinders authorized, but new construction not authorized.

(i) Foreign cylinders in domestic use. Except as provided in paragraph (j) of this section, a charged cylinder manufactured outside the United States may not be offered for transportation to, from, or

within the United States unless it has been manufactured, inspected, and tested in accordance with the U.S. DOT regulations.

(j) Charging of foreign cylinders for

export. Unless it has been manufactured, inspected, and tested in accordance with the U.S. DOT regulations, a cylinder manufactured outside the United States and received in the United States for charging with compressed gas may be charged and shipped for export only.

(1) Provided that they are retested in accordance with § 173.34(e). This retest may be omitted only if the container can be definitely identified as having been retested under this provision within the prescribed retest period, and

(2) Provided further that the maximum filling density and service pressure for each container shall be in accordance with all packing requirements of this Part for the compressed gas involved.

(3) Records showing the results of the tests made on all foreign containers must be preserved for inspection until the next scheduled retest date.

(4) Bill of lading or other shipping paper shall, when possible, identify the containers and shall carry the following certification: "These containers have been retested and refilled in accordance with the DOT requirements for export"

(k) Outside packagings. Specifications 2P, 2Q, 3E, 9, 39, 40, and 41 must be shipped in strong outside packagings.

(1) Outside packagings must provide protection for the complete cylinder and against accidental functioning of and damage to valves under conditions normally incident to transportation.

(l) Specifications 3AX, 3AAX, and 3T cylinders are authorized for transportation only when horizontally mounted on a motor vehicle and when valves and safety devices are protected, as follows:

(1) Each cylinder must be fixed at one end of the vehicle with provision for thermal expansion at the opposite end attachment.

(2) The valve and safety relief device protective structure must be sufficiently strong to withstand a force equal to twice the weight involved with a safety factor of four, based on the ultimate strength of the material used; and

(3) Each discharge for a safety relief device on a cylinder containing a flammable gas must be upward and unobstructed.

§ 173.302 Charging of cylinders with non-liquefied compressed gases.

(a) *Detailed requirements.* Nonliquefied compressed gases (except gas in solution or poisonous gas) for which charg-

ing requirements are not definitely prescribed in § 173.304(a)(2) must be shipped, subject to § 173.301, and § 173.305 in specification containers as follows:

(1) Specification 3,¹ 3A, 3AA, 3E, 3C, 3D, 3E, 4, 4A, 4B, 4BA, 4BW, 4C, 25,¹ 26,¹ 33,¹ or 38¹ (§§ 178.36, 178.37, 178.38, 178.40, 178.41, 178.42, 178.48, 178.49, 178.50, 178.51, 178.52, 178.61 of this subchapter). See §§ 173.34 and 173.301(e).)

NOTE 1: Authorized cylinders containing oxygen which is continuously fed to tanks containing live fish may be shipped irrespective of the provisions of § 173.24.

(2) [Reserved]

(3) Specification 3AX, 3AAX, or 3T (§§ 178.36, 178.37, 178.45 of this subchapter) cylinders are authorized only for the following nonliquefied gases: air, argon, carbon monoxide, ethane, ethylene, helium, hydrogen, methane, neon, nitrogen, or oxygen, except that specification 3T is not authorized for hydrogen.

(4) Specification 39 (§ 178.65 of this subchapter). For flammable gases, internal volume must not exceed 75 cubic inches.

(b) *Filling limits.* (See § 173.301(e).)

(c) *Special filling limits for Specifications 3A, 3AX, 3AA, 3AAX, and 3T cylinders.* Specifications 3A, 3AX, 3AA, 3AAX, and 3T (§§ 178.36, 178.37, 178.45 of this subchapter) cylinders may be charged with compressed gases, other than liquefied, dissolved, poisonous, or flammable gases to a pressure 10 percent in excess of their marked service pressure, provided:

(1) That such cylinders are equipped with frangible disc safety relief devices (without fusible metal backing) having a bursting pressure not exceeding the minimum prescribed test pressure.

(2) That the elastic expansion shall have been determined at the time of the last test or retest by the water jacket method.

¹ Use of existing cylinders authorized, but new construction not authorized.

(3) That either the average wall stress or the maximum wall stress shall not exceed the wall stress limitation shown in the following table (see Notes 1 and 2):

Type of steel	Average wall stress limitation	Maximum wall stress limitation
Plain carbon steels over 0.35 carbon and medium manganese steels	53,000	58,000
Steels of analysis and heat-treatment specified in spec. 3AAX	67,000	73,000
Steel of analysis and heat-treatment specified in Spec. DOT-3T	87,000	94,000
Plain carbon steels less than 0.35 carbon made prior to 1920	45,000	48,000

NOTE 1: The average wall stress shall be computed from the elastic expansion data using the following formula:

$$S = \frac{1.7EE}{KV} - 0.4P$$

where—

S = wall stress, pounds per square inch;

EE = elastic expansion (total less permanent) in cubic centimeters;

K = factor $\times 10^{-7}$ experimentally determined for the particular type of cylinder being tested;

V = internal volume in cubic centimeter (1 cubic inch = 16.387 cubic centimeters);

P = test pressure, pounds per square inch.

Formula derived from formula of Note 2 and the following:

$$EE = PKV \times \frac{D^2}{D^2 - d^2}$$

NOTE 2: The maximum wall stress shall be computed from the formula:

$$S = P \frac{(1.3D^2 + 0.4d^2)}{D^2 - d^2}$$

where—

S = wall stress, pounds per square inch;

P = test pressure, pounds per square inch;

D = outside diameter, inches;

$d = D - 2t$, where t = minimum wall thickness determined by a suitable method

(4) That an external and internal visual examination made at the time of test or retest shows the cylinder to be free from excessive corrosion, pitting, or dangerous defects.

(5) That a plus sign (+) be added following the test date marking on the cylinder to indicate compliance with subparagraphs (2), (3), and (4) of this paragraph.

(d) *Fluorine.* Fluorine must be shipped in Specification 3A1000, 3AA1000, or 3BN400 (§ 178.36, § 178.37 or § 178.39 of this subchapter) cylinders without safety relief device and equipped with valve protection cap. Such containers must not be charged to over 400 psig at 70° F. and must not contain over 6 pounds of gas.

(e) *Verification of container pressure.*

(1) Each day, the pressure in a con-

tainer representative of that day's compression must be checked by the charging plant after the container has cooled to a settled temperature and a record of this test kept for at least 30 days.

(f) *Carbon monoxide.* Carbon monoxide must be shipped in a specification 3A, 3AX, 3AA, 3AAX, 3, 3E, or 3T (§§ 178.36, 178.37, 178.42, 178.45 of this subchapter) cylinder having a minimum service pressure of 1,800 p.s.i.g. The pressure in the cylinder must not exceed 1000 p.s.i.g. at 70° F. except that if the gas is dry and sulfur free, a cylinder may be charged to five-sixths the cylinder service pressure or 2,000 p.s.i.g., whichever is the lesser.

§ 173.303 Charging of cylinders with compressed gas in solution (acetylene).

(a) *Cylinder, filler and solvent requirements.* (Refer to applicable parts of Specs. DOT 8 and DOT 8AL.) Acetylene gas must be shipped in cylinders, spec. 8 or 8AL (§ 178.59 or § 178.60 of this subchapter). The cylinders shall consist of metal shells filled with a porous material that has been tested with satisfactory results by the Bureau of Explosives, and this material must be charged with a suitable solvent.

(1) The specific gravity of acetone solvent in acetylene cylinders must be 0.796 or over at 15.5° C. (59.9° F.).

(2) The amount of solvent added in the refilling operation must not cause the tare weight of the cylinder to exceed its marked tare weight. The tare weight includes the weight of the cylinder shell, porous filling, valve, safety relief devices and solvent, but without removable cap.

(b) *Filling limits.* The pressure in cylinders containing acetylene gas must not exceed 250 psi at 70° F., and in case the cylinders are marked for a lower allowable charging pressure, at 70° F., then that pressure must not be exceeded.

(c) *Data requirements on filler and solvent.* Cylinders containing acetylene gas must not be shipped unless they were

charged by or with the consent of the owner, and by a person, firm, or company having possession of complete information as to the nature of the porous filling, the kind and quantity of solvent in the cylinders, and the meaning of such markings on the cylinders as are prescribed by the Department's regulations and specifications applying to containers for the transportation of acetylene gas.

(d) *Verification of container pressure.*

(1) Each day, the pressure in a container representative of that day's compression must be checked by the charging plant after the container has cooled to a settled temperature and a record of this test kept for at least 30 days.

§ 173.304 Charging of cylinders with liquefied compressed gas.

(a) *Detailed charging requirements.* Liquefied gases shall be charged in accordance with the specific provisions of subparagraph (2) of this paragraph or paragraph (e) of this section. Where charging requirements are not specifically prescribed, liquefied gases, except gas in solution or poisonous gas, must be

shipped, subject to the applicable paragraphs under General Requirements for Shipment (see § 173.301), the charging requirements of this section for liquefied compressed gas, or the charging requirements for mixtures (see § 173.305), in containers manufactured under specifications, as follows:

(1) Specifications 3,¹ 3A, 3AA, 3B, 3BN, 3D, 3E, 4, 4A, 4B, 4BA, 4B-ET, 4BW, 9,¹ 25,¹ 26,¹ 38,¹ 39, 40,¹ or 41¹ (§§ 178.36, 178.48, 178.49, 178.50, 178.51, 178.55, 178.61, 178.65 of this subchapter), except that no specification 9, 39, 40, or 41 packaging may be charged and shipped with a mixture containing a pyrophoric liquid, carbon bisulfide (disulfide), ethyl chloride, ethylene oxide, nickel carbonyl, spirits of nitroglycerin, or poisonous material (Class A, B, or irritating material), unless specifically authorized in this Part.

(i) For flammable gases, the internal volume of a specification 39 cylinder must not exceed 75 cubic inches.

(2) The following restrictions must be complied with for the gases named:

¹ Use of existing cylinders authorized, but new construction not authorized.

Kind of gas	Maximum permitted filling density (see Note 1)	Containers marked as shown in this column or of the same type with higher service pressure must be used except as provided in § 173.34 (a), (b), § 173.301(f) (see notes following table).
	<i>Percent</i>	
Anhydrous ammonia.....	54.....	DOT-4; DOT-3A480; DOT-3AA480; DOT-3A480X; DOT-4A480; DOT-3; DOT-4AA480; DOT-3E1800; DOT-4L200.
Argon, pressurized liquid.....	115.....	DOT-3A1800; DOT-3AX1800; DOT-3AA1800; DOT-3AA1800; DOT-3; DOT-3E1800; DOT-3T1800; DOT-3HT2000; DOT-39.
Carbon dioxide, liquefied (see Notes 4, 7, and 8).....	68.....	DOT-3A1800; DOT-3AN1800; DOT-3AA1800; DOT-3AA1800; DOT-3; DOT-3E1800; DOT-3T1800; DOT-3HT2000; DOT-39.
Carbon dioxide-nitrous oxide mixture (see Notes 7 and 8).....	68.....	DOT-3A480; DOT-3AA480; DOT-25; DOT-3; DOT-3BN480; DOT-3E1800.
Chlorine (see Note 2).....	125.....	DOT-3A225; DOT-3AA225; DOT-3B225; DOT-3E1800; DOT-4A225; DOT-4AA480; DOT-4B225; DOT-4BA225; DOT-4BW225; DOT-4B240ET; DOT-3; DOT-3E1800; DOT-39.
Cyclopropane (see Notes 8 and 9).....	55.....	DOT-3A225; DOT-3AA225; DOT-3B225; DOT-4A225; DOT-4B225; DOT-4BA225; DOT-4BW225; DOT-4B240ET; DOT-3; DOT-3E1800; DOT-39.
Dichlorodifluoromethane (see Note 8).....	119.....	DOT-3A240; DOT-3AA240; DOT-3B240; DOT-3E1800; DOT-4A240; DOT-4B240; DOT-4BA240; DOT-4BW240; DOT-4E240; DOT-9; DOT-39.
Dichlorodifluoromethane and difluoroethane mixture (constant boiling mixture) (see Note 8).....	Not liquid full at 130° F.	DOT-3A150; DOT-3AA150; DOT-3R150; DOT-4B150; DOT-4BA225; DOT-4BW225; DOT-3E1800.
Difluoroethane.....	79.....	DOT-3A150; DOT-3AA150; DOT-3R150; DOT-4B150; DOT-4BA225; DOT-4BW225; DOT-3E1800; DOT-39.
Difluoromonoethane (see Note 8).....	100.....	DOT-3A150; DOT-3AA150; DOT-3R150; DOT-4B150; DOT-4BA225; DOT-4BW225; DOT-3E1800; DOT-39.

See notes at end of table.

Kind of gas	Maximum permitted filling density (see Note 1)	Containers marked as shown in this column or of the same type with higher service pressure must be used except as provided in §173.34 (a), (b), §173.301(j) (see notes following table).
	<i>Percents</i>	
Dimethylamine, anhydrous.....	59.....	DOT-3A150; DOT-3AA150; DOT-3B150; DOT-4B150; DOT-4BA225; DOT-4BW225; ICC-3F1800.
Ethane (see Notes 8 and 9).....	35.8.....	DOT-3A1800; DOT-3AX1800; DOT-3AA1800; DOT-3AAX1800; DOT-3; DOT-3E1800; DOT-3T1800; DOT-39.
Ethane (see Notes 8 and 9).....	36.8.....	DOT-3A2000; DOT-3AX2000; DOT-3AA2000; DOT-3AAX2000; DOT-3T2000; DOT-39.
Ethylene (see Notes 8 and 9).....	31.0.....	DOT-3A1800; DOT-3AX1800; DOT-3AA1800; DOT-3AAX1800; DOT-3; DOT-3E1800; DOT-3T1800; DOT-39.
Ethylene (see Notes 8 and 9).....	32.5.....	DOT-3A2000; DOT-3AX2000; DOT-3AA2000; DOT-3AAX2000; DOT-3T2000; DOT-39.
Ethylene (see Notes 8 and 9).....	35.5.....	DOT-3A2400; DOT-3AX2400; DOT-3AA2400; DOT-3AAX2400; DOT-3T2400; DOT-39.
Hydrogen chloride.....	65.....	DOT-3A1800; DOT-3AA1800; DOT-3AX1800; DOT-3AAX1800; DOT-3; DOT-3E1800.
Hydrogen sulfide (see Note 10).....	62.5.....	DOT-3A480; DOT-3AA480; DOT-3B480; DOT-4A480; DOT-4BA480; DOT-4BA480; DOT-4BW480; DOT-26-480; DOT-3E1800.
Insecticide, liquefied gas (see Note 8)...	Not liquid full at 130° F.	DOT-3A300; DOT-3AA300; DOT-3B300; DOT-4B300; DOT-4BA300; DOT-4BW300; DOT-9; DOT-40; DOT-41; DOT-3E1800.
Liquefied nonflammable gases, liquid other than those classified as flammable, corrosive, or poisonous, and mixtures or solutions thereof, charged with nitrogen, carbon dioxide, or air (see Notes 7 and 8).	Not liquid full at 130° F.	DOT-3A300; DOT-3AA300; DOT-3HT900; DOT-4B300; DOT-4BA300; DOT-4BW300; DOT-4D300; DOT-4DA500; DOT-4DS500; DOT-3E1800; DOT-39.
Methylacetylene-propadiene, stabilized (see Note 5).	Not liquid full at 130° F.	
Methyl chloride.....	84.....	DOT-4B240, without brazed seams; DOT-4BA240, without brazed seams; DOT-3A240; DOT-3AA240; DOT-3B240; DOT-3E1800; DOT-4BW240; DOT-4E240; DOT-4B240ET; DOT-4; DOT-41.
Methyl mercaptan.....	80.....	DOT-3A225; DOT-3AA225; DOT-3B225; DOT-4A225; DOT-4B225; DOT-4BA225; DOT-4BW225; DOT-3; DOT-4; DOT-25; DOT-26-300; DOT-38; DOT-3E1800; DOT-4B240ET. Cylinders complying with DOT-3A150; DOT-3B150; DOT-4A150, and DOT-4B150 manufactured prior to Dec. 7, 1936 are also authorized.
Monochlorodifluoromethane (see Note 8)	105.....	DOT-3A240; DOT-3AA240; DOT-3B240; DOT-4B240; DOT-4BA240; DOT-4BW240; DOT-4B240ET; DOT-4E240; DOT-39; DOT-41; DOT-3E1800.
Monochloropentafluoroethane (see Note 8).	110.....	DOT-3A225; DOT-3AA225; DOT-3B225; DOT-4A225; DOT-4B225; DOT-4BA225; DOT-4BW225; DOT-3E1800; DOT-39.
Monochlorotrifluoromethane (see Note 8)	100.....	DOT-3A1800; DOT-3AA1800; DOT-3; DOT-3E1800; DOT-39.
Monomethylamine, anhydrous.....	60.....	DOT-3A150; DOT-3AA150; DOT-3B150; DOT-4B150; DOT-4BA225; DOT-4BW225; DOT-3E1800.
Nitrogen, pressurized liquid.....	68.....	DOT-4L200.
Nitrosyl chloride.....	110.....	DOT-3B2400 only.
Nitrous oxide (see Notes 7 and 8).....	68.....	DOT-3A1800; DOT-3AX1800; DOT-3AA1800; DOT-3AAX1800; DOT-3; DOT-3E1800; DOT-3T1800; DOT-3HT2000; DOT-39.
Oxygen, pressurized liquid.....	96.....	DOT-4L200.
Sulfur dioxide (see Note 8).....	125.....	DOT-3A225; DOT-3AA225; DOT-3B225; DOT-4A225; DOT-4B225; DOT-4BA225; DOT-4BW225; DOT-4B240ET; DOT-3; DOT-4; DOT-25; DOT-26-150; DOT-38; DOT-39; DOT-3E1800.
Sulfur hexafluoride.....	110.....	DOT-3A1000; DOT-3AA1000; DOT-3; DOT-3E1800.
Sulfuryl fluoride.....	108.....	DOT-3A480; DOT-3AA480; DOT-4B480; DOT-4BA480; DOT-4BW480.
Tetrafluoroethylene, inhibited.....	90.....	DOT-3A1200; DOT-3AA1200; DOT-3E1800.
Trifluorochloroethylene.....	115.....	DOT-3A300; DOT-3AA300; DOT-3B300; DOT-4A300; DOT-4B300; DOT-4BA300; DOT-4BW300; DOT-3E1800.
Trimethylamine, anhydrous.....	57.....	DOT-3A150; DOT-3AA150; DOT-3B150; DOT-4B150; DOT-4BA225; DOT-4BW225; DOT-3E1800.

See notes at end of table.

Kind of gas	Maximum permitted filling density (see Note 1)	Containers marked as shown in this column or of the same type with higher service pressure must be used except as provided in § 173.34 (a), (b), § 173.301(j) (see notes following table).
	Percent	
Vinyl chloride (see Note 5).....	84.....	DOT-4B150, without brazed seams; DOT-4BA225, without brazed seams; DOT-4BW225; DOT-3A150, DOT-3AA180; DOT-25; DOT-3E1800.
Vinyl fluoride, inhibited.....	62.....	DOT-3A1800; DOT-3AA1800; DOT-3E1800.
Vinyl methyl ether, inhibited (see Note 5).....	68.....	DOT-4B150, without brazed seams; DOT-4BA225, without brazed seams; DOT-4BW225; DOT-3A150, DOT-3AA150 DOT-3B150; DOT-25; DOT-3E1800.

NOTE 1: The "filling density" is hereby defined as the percent ratio of the weight of gas in a container to the weight of water that the container will hold at 60° F. (1 lb. of water = 27.37 cubic inches at 60° F.).

NOTE 2: Cylinders purchased after Oct. 1, 1944, for the transportation of chlorine must contain no aperture other than that provided in the neck of the cylinder for attachment of a valve equipped with an approved safety relief device. Cylinders purchased after Nov. 1, 1935, and charged with chlorine must not contain over 150 pounds of gas.

NOTE 3: [Reserved]

NOTE 4: Special carbon dioxide mining devices containing a heating element and charged with not over 6 pounds of carbon dioxide may be filled to a density of not over 85 percent, provided the cylinder is made of steel with a calculated bursting pressure in excess of 39,000 psi, be fitted with a frangible disc that will operate at not over 57 percent of that pressure, and be able to withstand a drop of 10 feet when striking crosswise on a steel rail while under a pressure of at least 3,000 psi. Such devices must be shipped in strong boxes or must be wrapped in heavy burlap and bound by 12-gauge wire with the wire completely covered by friction tape. Wrapping must be applied so as not to interfere with the functioning of the frangible disc safety relief device. Shipments must be described as "liquefied carbon dioxide gas (mining device)" and marked, labeled, and certified as prescribed for liquefied carbon dioxide.

NOTE 5: All parts of valve and safety relief devices in contact with contents of cylinders must be of a metal or other material, suitably treated if necessary, which will not cause formation of any acetylides.

NOTE 6: [Reserved]

NOTE 7: Spec. DOT-3HT (§ 173.44 of this subchapter) cylinders for aircraft use only having a maximum service life of 15 years. Authorized only for nonflammable gases. Cylinders must be equipped with safety relief devices only of the frangible disc type which meet the requirements of § 173.34(d). Each frangible disc must have a rated bursting pressure which does not exceed 90 percent of the minimum required test pressure of the cylinder. Discs with fusible metal backing are not permitted. Spec. 3HT cylinders may be shipped only when packed in strong outside packagings.

NOTE 8: See § 173.301(k).

NOTE 9: When used for shipment of flammable gases, the internal volume of a specification 39 cylinder must not exceed 75 cubic inches.

NOTE 10: Each valve outlet must be sealed by a threaded cap or a threaded solid plug.

(b) Filling limits. (See § 173.301(f).)

(1) For a liquefied compressed gas the liquid portion of the content at 130° F. must not completely fill the container.

NOTE 1: Maximum filling densities are permitted by paragraph (a) (2) of this section for certain liquefied compressed gases, having critical temperatures below 130° F. that result in the container being liquid full below the critical temperature, but because of compressibility of the liquids, the maximum pressure requirements of § 173.301(f) are met up to and including 130° F.

NOTE 2: Cylinders containing vinyl fluoride, inhibited, may be liquid full at 130° F. provided the pressure at the critical temperature does not exceed one and one-fourth times the service pressure.

(2) The pressure in DOT-4L cylinders (§ 178.57 of this subchapter) must be limited by a pressure controlling valve so sized and set as to limit the pressure to one and one-fourth times the marked service pressure. For hydrogen, a valve must be set as specified in § 173.316(a) (2). The design and installation of pressure-controlling valves must be such as to assure that they will not malfunction because of frost accumulation. The liquid portion of the gas must not com-

pletely fill the cylinder. For DOT-4L cylinders insulated by a vacuum, the pressure control valve must be set at least 15 psi lower than one and one-fourth times the marked service pressure. The other paragraphs of this section do not apply to DOT-4L cylinders.

(c) Verification of content in cylinder.

(1) Liquefied gases must be charged by weight, by volume measurement of liquid, charging line, by the use of proper scales or when lower in pressure than required for liquefaction a pressure-temperature chart may be used in charging to insure that the service pressure at 70° F. times 5/4 will not be exceeded at 130° F.

(2) Except as noted in paragraph (d)

(4) of this section, the amount of liquefied gas charged into a container must be determined by weight, or if charged at a pressure lower than the liquefaction point, by pressure shown on a chart for the specific gas. Weight must be checked, after disconnecting from the charging line, by the use of proper scales.

(d) Requirements for liquefied petroleum gas. (1) Filling density limited as follows:

Minimum specific gravity of the liquid material at 60° F.	Maximum filling density in percent of the water-weight capacity of the container	Minimum specific gravity of the liquid material at 60° F.	Maximum filling density in percent of the water-weight capacity of the container
0.271-0.289	26	0.504-0.510	42
0.290-0.306	27	0.511-0.519	43
0.307-0.322	28	0.520-0.527	44
0.323-0.338	29	0.528-0.536	45
0.339-0.354	30	0.537-0.544	46
0.355-0.371	31	0.545-0.552	47
0.372-0.398	32	0.553-0.560	48
0.399-0.425	33	0.561-0.568	49
0.426-0.440	34	0.569-0.576	50
0.441-0.452	35	0.577-0.584	51
0.453-0.462	36	0.585-0.592	52
0.463-0.472	37	0.593-0.600	53
0.473-0.480	38	0.601-0.608	54
0.481-0.488	39	0.609-0.617	55
0.489-0.495	40	0.616-0.626	56
0.496-0.503	41	0.627-0.634	57

(2) Subject to § 173.301(f), any filling density percentage prescribed in this section is authorized to be increased by 2 for liquefied petroleum gas in spec. 26 or

3 cylinders or in spec. 3A marked for 1.800 psig. or higher, service pressure.

(3) Liquefied petroleum gas must be shipped in specification containers as follows:

(i) Specifications 3,¹ 3A, 3AA, 3B, 3E, 4A, 4B, 4BA, 4B240ET, 4BW240, 4B240X,¹ 4B240FLW, 4E, 4, 9,¹ 25,¹ 28,¹ 38,¹ 39, or 41¹ (§§ 178.36, 178.37, 178.38, 178.42, 178.49, 178.50, 178.51, 178.55, 178.61, 178.54, 178.68, 178.48, 178.63, 178.65, 178.67 of this chapter). The internal volume of a specification 39 cylinder must not exceed 75 cubic inches

NOTE 1: Cylinders marked as complying with DOT spec. 4B240FLW bearing manufacturer's symbol WCO and serial numbers 47A-1 to 47A-59200, inclusive, varying from the specification requirements as to physical properties of steel, are authorized for the transportation of liquefied petroleum gases.

(ii) Additional containers may be used within the limits of quantity and pressure as follows:

Type of container	Maximum capacity		Maximum charging pressure—p.s.i.g.
	Cubic inches	Pounds	
DOT-1P or DOT-1Q—see Note 1	31.83		45 p.s.i.g. at 70° F. and 105 p.s.i.g. at 130° F. (see Note 2).
DOT-2P or DOT-2Q—see Note 1	31.83		35 p.s.i.g. at 70° F. and 100 p.s.i.g. at 130° F.
DOT-3C or DOT-4C	3.8±1	16±5% tolerance	145 p.s.i.g. at 130° F.

NOTE 1: Containers must be packed in strong wooden or fiber boxes of such design as to protect valves from injury or accidental functioning under conditions incident to transportation. Each completed container filled for shipment must have been heated until contents reached a minimum temperature of 130° F., without evidence of leakage, distortion, or other defect. Each outside shipping container must be plainly marked "INSIDE CONTAINERS COMPLY WITH PRESCRIBED SPECIFICATIONS."

NOTE 2: Containers must be equipped with safety relief devices which will prevent rupture of the containers and dangerous projection of the closing devices when the containers are exposed to the action of fire.

(4) Verification of content. Containers with a water capacity of 200 pounds or more and for use with a liquefied petroleum gas with a specific gravity at 60° F. or 0.504 or greater may have their contents determined by using a fixed length dip tube gauging device. The length of the dip tube shall be such that when a liquefied petroleum gas with a specific volume of 0.03051 cu. ft./lb. at a

temperature of 40° F. is charged into the container it just reaches the bottom of the tube. The weight of this liquid shall not exceed 42 percent of the water capacity of the container which must be stamped thereon. The length of the dip tube, expressed in inches carried out to one decimal place and prefixed with the letters "DT" shall be stamped on the container and on the exterior of removable type dip tube; for the purpose of this requirement the marked length shall be expressed as the distance measured along the axis of a straight tube from the top of the boss through which the tube is inserted to the proper level of the liquid in the container. The length of each dip tube shall be checked when installed by weighing each container after filling except when installed in groups of substantially identical containers in which case one of each 25 containers shall be weighed. The quantity of lique-

¹ Use of existing cylinders authorized, but new construction not authorized.

fied gas in each container must be checked by means of the dip tube after disconnecting from the charging line. The outlet from the dip tube shall be not larger than a No. 54 drill size orifice. A container representative of each day's filling at each charging plant shall have its contents checked by weighing after disconnecting from the charging line.

(e) *Refrigerant gases.* Refrigerant gases which are nonpoisonous and nonflammable under this part, must be shipped in cylinders as prescribed in paragraph (a)(1) or (2) of this section, or as follows:

(1) Specifications 2P and 2Q (§§178.33, 178.33a of this subchapter). Inside metal containers packed in a strong wooden or fiberboard box of such design as to protect valves from injury or accidental functioning under conditions incident to transportation. Pressure in the container must not exceed 85 pounds per square inch absolute at 70° F. Each completed metal container filled for shipment must be heated until content reaches a minimum temperature of 130° F. without evidence of leakage, distortion, or other defect. Each outside shipping container must be plainly marked "Inside Containers Comply With Prescribed Specification."

(f) *Engine starting fluid.* Engine starting fluid containing compressed gas or gases which are flammable under this part must be shipped in cylinders as prescribed in paragraph (a)(1) of this section, or as follows:

(1) Inside nonrefillable metal containers of capacity not exceeding 32 cubic inches. Containers must be packaged in spec. 12B (§ 178.205 of this subchapter) fiberboard boxes equipped with top and bottom pads which will provide three complete thicknesses of fiberboard on tops and bottoms of boxes, or spec. 15A, 15B, or 15C (§ 178.168, § 178.169, or § 178.170 of this subchapter) wooden boxes. Pressure in the container must not exceed 140 psi, absolute, at 130° F. However, if the pressure exceeds 140 psi, absolute at 130° F., a spec. 2P (§ 178.33 of this subchapter) container must be used. In any event, the metal container must be capable of withstanding without bursting a pressure of one and one-half times the pressure of the content at 130° F. The liquid content of the material and gas must not completely fill the container at 130° F. Each completed container filled for shipment must

have been heated until content reaches a minimum temperature of 130° F., without evidence of leakage, distortion, or other defect. Each outside shipping container must be plainly marked, "INSIDE CONTAINERS COMPLY WITH PRESCRIBED SPECIFICATIONS."

§ 173.305 Charging of cylinders with a mixture of compressed gas and other material.

(a) *Detailed requirements.* A mixture of a compressed gas and any other material must be shipped as a compressed gas if the mixture is a compressed gas as designated in § 173.300(a) and when not in violation of § 173.301(a).

(b) *Filling limits.* (See § 173.301(e).) For mixtures, the liquid portion of the liquefied compressed gas at 130° F. plus any additional liquid or solid must not completely fill the container.

(c) *Nonpoisonous and nonflammable mixtures.* Mixtures containing compressed gas or gases including insecticides, which mixtures are nonpoisonous and nonflammable under this Part must be shipped in cylinders as prescribed in § 173.304(a) or as follows:

(1) Spec. 2P (§ 178.33 of this subchapter). Inside metal containers equipped with safety relief devices of a type approved by the Bureau of Explosives and packed in strong wooden or fiber boxes of such design as to protect valves from injury or accidental functioning under conditions incident to transportation. Pressure in the container must not exceed 85 psi absolute at 70° F. Each completed metal container filled for shipment must be heated until content reaches a mini-

mum temperature of 130° F., without evidence of leakage, distortion or other defect. Each outside shipping container must be plainly marked "INSIDE CONTAINERS COMPLY WITH PRESCRIBED SPECIFICATIONS."

(d) *Poisonous mixtures.* A mixture containing any poisonous material, Class A, or irritating material in such proportions that the mixture would be classed as poisonous under § 173.326(a) or § 173.381(a) must be shipped in packagings as authorized for these poisonous materials.

§ 173.306 Limited quantities of compressed gases.

(a) Limited quantities of compressed gases for which exceptions are permitted as noted by reference to this section in § 172.101 of this subchapter are excepted from labeling and, unless required as a condition of the exception, specification packaging requirements of this subchapter when packed in accordance with the following paragraphs. In addition, shipments are not subject to Part 172 or Part 177 of this subchapter.

(1) When in containers of not more than 4 fluid ounces capacity (7.22 cubic inches or less) except cigarette lighters. Special exceptions for shipment of certain compressed gases in the ORM-D class are provided in Subpart N of this part.

(2) When in metal containers filled with a material that is not classed as a hazardous material to not more than 90 percent of capacity at 70° F. then charged with nonflammable, nonliquefied gas. Each container must be tested to three times the pressure at 70° F. and, when refilled, be retested to three times the pressure of the gas at 70° F. Also, one of the following conditions must be met:

(i) Container is not over 1 quart capacity and charged to not more than 170 psig at 70° F. and must be packed in a strong outside packaging, or

(ii) Container is not over 30 gallons capacity and charged to not more than 75 psig at 70° F.

(3) When in a metal container charged with a solution of materials and compressed gas or gases which is non-poisonous, provided all of the following conditions are met. Special exceptions for shipment of aerosols in the ORM-D class are provided in Subpart N of this part.

(i) Capacity must not exceed 50 cubic inches (27.7 fluid ounces).

(ii) Pressure in the container must not exceed 180 psig at 130° F. If the pressure exceeds 140 psig at 130° F., but does not exceed 160 psig at 130° F., a specification DOT 2P (§ 178.33 of this subchapter) inside metal container must be used; if the pressure exceeds 160 psig at 130° F., a specification DOT 2Q (§ 178.33a of this subchapter) inside metal container must be used. In any event, the metal container must be capable of withstanding without bursting a pressure of one and one-half times the equilibrium pressure of the content at 130° F.

(iii) Liquid content of the material and gas must not completely fill the container at 130° F.

(iv) The container must be packed in strong outside packagings.

(v) Each completed container filled for shipment must have been heated until the pressure in the container is equivalent to the equilibrium pressure of the content at 130° F. (55° C.) without evidence of leakage, distortion, or other defect.

(vi) Each outside packaging must be marked "INSIDE CONTAINERS COMPLY WITH PRESCRIBED REGULATIONS."

(b) Exemptions for foodstuffs, soap, biologicals, electronic tubes, and audible fire alarm systems. Limited quantities of compressed gases, (except poisonous gases as defined by § 173.326) for which exceptions are provided as indicated by reference to this section in § 172.101 of this subchapter, when in accordance with one of the following paragraphs are excepted from labeling and the specification packaging requirements of this subchapter. In addition, shipments are not subject to Part 172 or Part 177 of this subchapter. Special exceptions for shipment of certain compressed gases in the ORM-D class are provided in Subpart N of this part.

(1) Foodstuffs or soaps in a nonrefillable metal container not exceeding 50

cubic inches capacity (27.7 fluid ounces), with soluble or emulsified compressed gas, provided the pressure in the container does not exceed 140 p.s.i.g. at 130° F. The metal container must be capable of withstanding without bursting a pressure of one and one-half times the equilibrium pressure of the content at 130° F.

(i) Containers must be packed in strong outside packagings.

(ii) Liquid content of the material and the gas must not completely fill the container at 130° F.

(iii) Each outside packaging must be marked "INSIDE CONTAINERS COMPLY WITH PRESCRIBED REGULATIONS."

(2) Cream in refillable metal receptacles with soluble or emulsified compressed gas. Containers must be of such design that they will hold pressure without permanent deformation up to 375 psig and must be equipped with a device designed so as to release pressure without bursting of the container or dangerous projection of its parts at higher pressures. This exception applies to shipments offered for transportation by refrigerated motor vehicles only.

(3) Nonrefillable metal containers charged with a solution containing biological products or a medical preparation which could be deteriorated by heat, and compressed gas or gases, which is nonpoisonous and nonflammable. The capacity of each container may not exceed 35 cubic inches (19.3 fluid ounces). The pressure in the container may not exceed 140 psig at 130° F., and the liquid content of the product and gas must not completely fill the containers at 130° F. One completed container out of each lot of 500 or less, filled for shipment, must be heated, until the pressure in the container is equivalent to equilibrium pressure of the content at 130° F. There must be no evidence of leakage, distortion, or other defect. Container must be packed in strong outside packagings.

(4) Electronic tubes, each having a volume of not more than 30 cubic inches and charged with gas to a pressure of not more than 35 psig and packed in strong outside packagings.

(5) Audible fire alarm systems powered by a compressed gas contained in an inside metal container when shipped under the following conditions:

(i) Each inside container must have contents which are not flammable,

poisonous, or corrosive as defined under this Part.

(ii) Each inside container may not have a capacity exceeding 35 cubic inches (19.3 fluid ounces);

(iii) Each inside container may not have a pressure exceeding 70 psig at 70° F. and the liquid portion of the gas may not completely fill the inside container at 130° F., and

(iv) Each nonrefillable inside container must be designed and fabricated with a burst pressure of not less than four times its charged pressure at 130° F. Each refillable inside container must be designed and fabricated with a burst pressure of not less than five times its charged pressure at 130° F.

(c) Fire extinguishers. Fire extinguishers charged with limited quantities of a compressed gas to not more than 240 psig at 70° F. are excepted from labeling and the specification packaging requirements of this subchapter when shipped under the following conditions. In addition, shipments are not subject to Part 172 or Part 177 of this subchapter.

(1) Each fire extinguisher must be shipped as an inside packaging;

(2) Each fire extinguisher must have contents which are not flammable, poisonous, or corrosive as defined under this Part;

(3) Each fire extinguisher under stored pressure may not have an internal volume exceeding 1,100 cubic inches. For fire extinguishers not exceeding 35 cubic inches capacity, the liquid portion of the gas plus any additional liquid or solid must not completely fill the container at 130° F. Fire extinguishers exceeding 35 cubic inches capacity may not contain any liquefied compressed gas;

(4) Each fire extinguisher manufactured on and after January 1, 1976, must be designed and fabricated with a burst pressure of not less than six times its charged pressure at 70° F. when shipped.

(5) Each fire extinguisher must be tested, without evidence of failure or damage, to at least three times its charged pressure at 70° F. but not less than 120 psig before initial shipment. For any subsequent shipment, each fire extinguisher must be in compliance with

the retest requirements of the Occupational Safety and Health Administration Regulations of the Department of Labor, 29 CFR 1910.157(d), and;

(6) Each fire extinguisher must be marked to indicate the year of the test (within 90 days of the actual date of the original test) and "MEETS DOT REQUIREMENTS." This marking will be considered a certification that the fire extinguisher was manufactured in accordance with the requirements of this section.

NOTE: The words "This extinguisher meets all requirements of 49 CFR 173.306" may be displayed in place of "MEETS DOT REQUIREMENTS" on extinguishers manufactured prior to January 1, 1976.

(7) When specification 2P or 2Q packagings are used, paragraphs (c) (4) through (6) of this section are not applicable provided each packaging meets the requirements of paragraph (a) of this section.

(d) *Truck bodies or trailers on flat cars; automobiles, motorcycles, tractors, or other self-propelled vehicles.* (1) Truck bodies or trailers with automatic heating or refrigerating equipment of the gas burning type may be shipped with fuel tanks filled and equipment operating or inoperative, when used for the transportation of other freight and loaded on flat cars as part of a joint rail-highway movement, provided the equipment and fuel supply are of a type approved by the Bureau of Explosives. The heating or refrigerating units are not subject to any other requirements of this subchapter and are to be considered as carriers equipment not as shipments.

(2) Automobiles, motorcycles, tractors, or other self-propelled vehicles equipped with liquefied petroleum gas or other compressed gas fuel tanks, provided such tanks are securely closed, are not subject to any other requirements of this chapter.

(3) A cylinder which is a component part of a passenger restraint system and is installed in a motor vehicle, charged with nonliquefied, nonflammable compressed gas and having no more than two actuating cartridges per valve, is excepted from the requirements of this chapter, except:

(i) Unless otherwise authorized by the Department, each cylinder must be in compliance with one of the cylinder specifications in Part 178 and authorized for use in § 173.302 for the gas it contains;

(ii) Each cylinder must be in compliance with the filling requirements of § 173.301; and

(iii) Each actuating cartridge must be approved in accordance with § 173.86 and meet the definition set forth in § 173.100(w).

NOTE.—A cylinder containing a gas generator may be included within the provisions of this exception if the requirements of § 173.34(d) are satisfied.

(e) *Refrigerating machines.* (1) New (unused) refrigerating machines or components thereof are excepted from the specification packaging requirements of this Part if they meet the following conditions. In addition, shipments are not subject to Part 172 or Part 177 of this subchapter.

(i) Each pressure vessel may not contain more than 5,000 pounds of Group I refrigerant as classified in American National Standard B9.1 or not more than 50 pounds of refrigerant other than Group I.

(ii) Machines or components having two or more charged vessels may not contain an aggregate of more than 2,000 pounds of Group I refrigerant or more than 100 pounds of refrigerant other than Group I.

(iii) Each pressure vessel must be equipped with a safety device meeting the requirements of American National Standard B9.1.

(iv) Each pressure vessel must be equipped with a shut-off valve at each opening except openings used for safety devices and with no other connection. These valves must be closed prior to and during transportation.

(v) Pressure vessels must be manufactured, inspected and tested in accordance with American National Standard B9.1, or when over 6 inches internal diameter, in accordance with the ASME Code.

(vi) All parts subject to refrigerant pressure during shipment must be tested in accordance with American National Standard B9.1.

(vii) The liquid portion of the refrigerant, if any, may not completely fill any pressure vessel at 130° F.

(viii) The amount of refrigerant, if liquefied, may not exceed the filling density prescribed in § 173.304.

(f) *Accumulators.* The following applies to accumulators, which are hydraulic accumulators containing nonliquefied, nonflammable gas, and nonflammable liquids or pneumatic accumulators containing nonliquefied, nonflammable gas, fabricated from materials which will not fragment upon rupture.

(1) Accumulators installed in motor vehicles, construction equipment, and assembled machinery and designed and fabricated with a burst pressure of not less than five times their charged pressure at 70° F., when shipped, are not subject to the requirements of this subchapter.

(2) Accumulators charged with limited quantities of compressed gas to not more than 200 p.s.i.g. at 70° F. are excepted from labeling and the specification packaging requirements of this subchapter when shipped under the following conditions. In addition, shipments are not subject to Part 172 or Part 177 of this subchapter.

(i) Each accumulator must be shipped as an inside packaging;

(ii) Each accumulator may not have a gas space exceeding 2,500 cubic inches under stored pressure, and

(iii) Each accumulator must be tested, without evidence of failure or damage, to at least three times its charged pressure of 70° F., but not less than 120 p.s.i. before initial shipment and before each refilling and reshipment.

(3) Accumulators with a charging pressure exceeding 200 p.s.i.g. at 70° F. are excepted from labeling and the specification packaging requirements of this subchapter when shipped under the following conditions:

(i) Each accumulator must be in compliance with the requirements stated in paragraph (f) (2), (i), (ii), and (iii) of this section, and

(ii) Each accumulator must be designed and fabricated with a burst pressure of not less than five times its charged pressure at 70° F. when shipped.

§ 173.307 Exceptions for compressed gases.

(a) The following materials are not subject to the requirements of this subchapter:

(1) Carbonated beverages.

(2) Inflated tires. (maximum pressure of 100 psig at 70° F)

(3) Balls used for sports.

(4) Refrigerating machines including dehumidifiers and air conditioners, and components thereof such as precharged tubing containing 25 pounds or less of nonflammable liquefied gas.

§ 173.308 Cigarette lighter or other similar device charged with fuel.

(a) In addition to the requirements of § 173.21(d), a cigarette lighter or other similar device charged with butane or a flammable gas having similar properties must be shipped in accordance with the following:

(1) No more than 2.3 fluid ounces of liquefied gas may be loaded into each device;

(2) The liquid portion of the gas may not exceed 85 percent of the volumetric capacity of each fluid chamber at 60° F.

(3) Each device, including closures, must be capable of withstanding without leakage or rupture an internal pressure of at least two times the vapor pressure of the fuel at 130° F; and

(4) Devices must be overpacked in packaging that is designed or arranged to prevent movement of the device itself.

(b) When no more than 1,500 devices covered by this section are transported in one motor vehicle by highway, the requirements of Parts 172 and 177 of this subchapter do not apply.

§ 173.314 Requirements for compressed gases in tank car tanks.

(a) *Definitions.* For definitions of compressed gases, see § 173.300.

(b) *General requirements.*

(1) Tank car tanks containing compressed gases must not be shipped unless they were loaded by or with the consent of the owner thereof.

(2) Tank car tanks must not contain gases capable of combining chemically and must not be loaded with any gas which combines chemically with the gas previously loaded therein, until all residue has been removed and interior of tank thoroughly cleaned.

(3) For cars of the DOT-106A and 110A class, the tanks must be placed in position and attached to car structure by the shipper.

(4) [Reserved]

(5) [Reserved]

(6) Each tank car tank containing anhydrous ammonia or chlorine must be marked "ANHYDROUS AMMONIA" or "CHLORINE," as appropriate, in accordance with the requirements of § 172.330 of this subchapter.

(c) Authorized gases, filling densities, tank car tanks. Compressed gases transported in tank car tanks must be shipped as provided in paragraphs (b) to (g) of this section, § 173.432, and the following table:

Kind of gas	Maximum permitted filling density, Note 1	Required tank car, see 173.31 (a) (2) and (3)
	Percent	
Anhydrous ammonia -----	50 -----	DOT-106A500-X, Note 7.
Ammonia solution -----	Note 21 -----	
Chlorine -----	125 -----	DOT-106A500X, Note 7.
Crude nitrogen fertilizer solution -----	Note 21 -----	DOT-106A500X.
Crude nitrogen fertilizer solution (pressure not exceeding 75 pounds per square inch at 105° F.).	Note 21 -----	DOT-106A500X.
Dichlorodifluoromethane; Note 13 -----	119 -----	DOT-106A500X, 110A500-W, Note 7.
Dichlorodifluoromethane and difluoroethane mixture (constant boiling mixture); Note 13.	Note 22 -----	DOT-106A500X, 110A500-W, Note 7.
Dichlorodifluoromethane-dichlorotetrafluoroethane mixture; Note 13.	119 -----	DOT-106A500X, 110A500-W, Note 7.
Dichlorodifluoromethane-monochlorodifluoromethane mixture; Note 13.	119 -----	DOT-106A500X, 110A500-W, Note 7.
Dichlorodifluoromethane-monofluorotrichloromethane mixture; Note 13.	Note 22 -----	DOT-106A500X, 110A500-W, Note 7.
Dichlorodifluoromethane-trichloromonofluoromethane-monochlorodifluoromethane mixture; Note 13.	119 -----	DOT-106A500X, 110A500-W, Note 7.
Dichlorodifluoromethane-trichlorotrifluoroethane mixture; Note 13.	119 -----	DOT-106A500X, 110A500-W, Note 7.
Difluoroethane -----	79 -----	DOT-106A500X, 110A500-W, Note 7.
Difluoromonochloroethane; Note 13 -----	100 -----	DOT-106A500X, 110A500-W, Note 7.
Dimethylamine, anhydrous -----	59 -----	DOT-106A500X.
Dimethyl ether -----	59 -----	DOT-106A500X, 110A500-W.

See notes at end of table.

Kind of gas	Maximum permitted filling density, Note 1	Required tank car, see 173.31 (a) (2) and (3)
Fertilizer ammoniating solution containing free ammonia.	Note 21 -----	DOT-106A500X.
Fertilizer ammoniating solution containing free ammonia (pressure not exceeding 75 pounds per square inch at 105°F.).	Note 21 -----	DOT-106A500X.
Fertilizer ammoniating solution containing free ammonia (pressure not exceeding 150 pounds per square inch at 105°F.).	Note 21 -----	DOT-106A500X.
Hexafluoropropylene -----	110 -----	DOT-106A500-X, 110A500-W, Note 7.
Hydrogen sulfide -----	68 -----	DOT-106A800X, Notes 7 and 8.
Liquid hydrocarbon gas (pressure not exceeding 375 pounds per square inch at 130°F.).	Note 21 -----	DOT-106A500X.
Liquefied petroleum gas (pressure not exceeding 375 pounds per square inch at 130°F.).	Note 18 -----	DOT-106A500X.
Methylacetylene-propadiene, stabilized -----	Note 22 -----	106A500X, Note 9.
Methyl chloride -----	84 -----	DOT-106A500X, Note 7.
Methyl chloride-methylene chloride mixture -----	Note 22 -----	DOT-106A500X, Note 7.
Methyl mercaptan -----	80 -----	DOT-106A500X, Notes 7 and 14.
Monobromotrifluoromethane -----	124 -----	DOT-110A800-W, Notes 7 and 13.
Monochlorodifluoromethane; Note 13 -----	105 -----	DOT-106A500X, 110A500-W, Note 7.
Monochlorotetrafluoroethane; Note 13 -----	125 -----	DOT-106A500X, 110A500-W, Note 7.
Monomethylamine, anhydrous -----	60 -----	DOT-106A500X.
Nitrogen fertilizer solution -----	Note 21 -----	DOT-106A500X.
Nitrogen fertilizer solution (pressure not exceeding 75 pounds per square inch at 105°F.).	Note 21 -----	DOT-106A500X.
Nitrosyl chloride -----	110 -----	DOT-106A800-X, Notes 7 and 11.
Sulfur dioxide -----	125 -----	DOT-106A500X, 110A500-W, Note 7.
Trifluorochloroethylene -----	115 -----	DOT-106A500X, 110A500-W, Note 7.

Kind of gas	Maximum permitted filling density, Note 1	Required tank car, see 173.31 (a) (2) and (3)
Trimethylamine, anhydrous -----	57 -----	DOT-106A500X.
Vinyl chloride, Note 9 -----	84 -----	DOT-106A500X, Note 7.
Vinyl methyl ether, inhibited; Note 9 -----	68 -----	DOT-106A500-X, Note 7.

NOTE 1: The filling density for liquefied gases is hereby defined as the percent ratio of weight of gas in the tank to the weight of water that the tank will hold. For determining the water capacity of the tank in pounds, the weight of a gallon (231 cubic inches) of water at 60° F. in air shall be 8.32828 pounds.

NOTE 2: Each tank must be equipped with one or more safety relief devices of approved type and discharge area; the discharge outlet of each safety relief device must be connected to a manifold having an unobstructed discharge area of at least 1 1/2 times the total discharge area of the safety relief devices connected to the manifold; all manifolds must be connected to a single common header having an unobstructed discharge outlet pointing upward and extending above top of the car; the header and the header outlet must each have an unobstructed discharge area at least equal to the total discharge area of the manifolds connected to the header; the header outlet must be equipped with an approved ignition device which will instantly ignite any hydrogen discharged through the safety relief device.

NOTE 3: [Reserved]

NOTE 4: [Reserved]

NOTE 5: The liquid portion of the gas at 0° F. must not completely fill the tank.

NOTE 6: [Reserved]

NOTE 7: Specification 106A or 110A tanks authorized for transportation by highway. (See § 177.834(m) of this subchapter for special requirements.)

NOTE 8: Each tank must be equipped with adequate safety relief devices of the fusible plug type having a yield temperature not over 170° F., nor less than 157° F. Each device must be resistant to extrusion of the fusible alloy and leak tight at 130° F. Each valve outlet must be sealed by a threaded cap or a threaded solid plug. In addition, all valves must be protected by a metal cover.

NOTE 9: All parts of valves and safety relief devices in contact with content of tank must be of a metal or other material suitably treated if necessary, which will not cause formation of any acetylides.

NOTE 10: Tanks must be made of or clad with a metal not subject to rapid deterioration by the lading; all appurtenances such as manhole covers, venting, loading and discharge valves, safety relief valves, check valves, and eduction pipes, must be made of metal not subject to rapid deterioration by the lading; cork must be used as an insulating material.

NOTE 11: Tanks for nitrosyl chloride shall be nickel-clad and safety relief devices shall be of the fusible plug type and shall function at a temperature of not exceeding 175° F. and be vapor tight at 130° F.

NOTE 12: [Reserved]

NOTE 13: This gas may be transported in authorized tank car tanks stenciled "DISPERSANT GAS" or "REFRIGERANT GAS."

NOTE 14: Container shall not be equipped with safety relief devices of any description.

NOTE 15: [Reserved]

NOTE 16: [Reserved]

NOTE 17: [Reserved]

NOTE 18: See paragraph (f) of this section.

NOTE 19: See paragraph (f) (2) of this section.

NOTE 20: See paragraph (d) (1) of this section.

NOTE 21: See paragraph (d) (2) of this section.

NOTE 22: See paragraph (d) of this section.

(d) Filling limits—(1) Non-liquefied and liquefied gas. The gas pressure at 130° F. in any uninsulated tank car tank of the DOT-106A and 110A-W class must not exceed three-fourths times the prescribed retest pressure of the tank.

(2) Liquefied gas. In addition to the requirements of paragraph (d) (1) of this section, the liquid portion of the gas at 105° F. must not completely fill an insulated tank, nor at 130° F. must not completely fill an uninsulated tank.

(e) Verification of content. The amount of liquefied gas loaded into each tank may be determined either by measurement or calculation of the weight. If by measurement, the weight must be checked after disconnecting the loading line by the use of proper scales. If by calculation, the weight of liquefied petroleum gas, methylacetylene-propadiene, stabilized, dimethylamine, monomethylamine, or trimethylamine may be calculated using the outage tables supplied by the tank car owners and the specific gravities as determined at the plant, and this computation must be checked by determination of specific gravity of product

after loading. Carriers may verify calculated weights by use of proper scales.

(f) Special requirements for liquefied petroleum gas tank car tanks—

(1) [Reserved]

(2) DOT-106A class tank cars. Maximum filling density in DOT-106A class tank cars shall be as shown in § 173.304 (d) (1).

(g) Foreign tank cars in domestic use. Except as authorized by § 173.8 tank cars made in foreign countries, except Canada, must not be used in domestic traffic until they have been tested in this country and proper reports rendered as required by the specifications that apply.

§ 173.315 Compressed gases in cargo tanks and portable tank containers.

(a) Cargo tanks and portable tank containers must not contain gases capable of combining chemically.

(1) Compressed gases must not be shipped in cargo tanks or portable tank containers except as provided in this section and §§ 173.32 and 173.33, and in the following table (for marking requirements see §§ 172.326 and 172.328(d) of this subchapter):

Kind of gas	Maximum permitted filling density		Specification container required	
	Percent by weight (see Note 1)	Percent by volume (see par. (f) of this section)	Type (see Note 2)	Minimum design pressure (psig)
Anhydrous ammonia (see Note 14 and paragraph (1) of this section).	55.....	82; see Note 5.....	DOT-51, MC-330, MC-331; see Note 12.	265.
Anhydrous dimethylamine.....	59.....	See Note 7.....	DOT-51, MC-330, MC-331	150.
Anhydrous monomethylamine.....	60.....	.....do.....	.....do.....	150.
Anhydrous trimethylamine.....	57.....	.....do.....	.....do.....	150.
Ammonia solution.....	See par. (c) of this section.	.....do.....	MC-330, MC-331; see Note 12.	100; see par. (c)(1) of this section.
Butadiene, inhibited.....	See par. (b) of this section.	See par. (b) of this section.	DOT-51, MC-330, MC-331	100.
Carbon dioxide, liquefied.....	See par. (c) of this section.	95.....	.....do.....	200; see Note 3.
Chlorine.....	125.....	See Note 7.....	MC-330 MC-331..	225; see Notes 4 and 8.
Dichlorodifluoromethane (see Note 9).	119.....	.....do.....	DOT-51, MC-330, MC-331.	150.
Dichlorodifluoromethane and difluoroethane mixture (con- stant boiling mixture) (see Note 9).	See par. (c) of this section.	.....do.....	MC-330, MC-331..	250.
Dichlorodifluoromethane- dichlorotetrafluoroethane mixture (see Note 9).	119.....	.....do.....	DOT-51, MC-330, MC-331.	150.
Dichlorodifluoromethane- monofluorotrichloromethane mixture (see Note 9).	See par. (c) of this section.	.....do.....	.....do.....	150.
Difluoroethane.....	79.....	.....do.....	MC-330, MC-331..	150.
Difluoromonoethane (see Note 9).	100.....	.....do.....	MC 330, MC 331..	100.
Dimethyl ether (see Note 16)...	59.....	.....do.....	.....do.....	200.
Hexafluoropropylene.....	110.....	.....do.....	.....do.....	250.
Liquefied petroleum gas (see Note 15).	See par. (b) of this section.	See par. (b) of this section.	DOT-51, MC-330, MC-331.	See par. (c)(1) of this section.

Kind of gas	Maximum permitted filling density		Specification container required	
	Percent by weight (see Note 1)	Percent by volume (see par. (f) of this section)	Type (see Note 2)	Minimum design pressure (psig)
Methylacetylene-propadiene, stabilized (see Note 13).	53.....	90.....	DOT 51, MC 330, MC 331.	200.
Methyl chloride.....	84.....	88.5.....	do.....	150.
Methyl chloride (optional portable tank 2,000 pounds water capacity, fusible plug).	84.....	See Note 6.....	DOT-51.....	225.
Methyl mercaptan.....	80.....	90.....	DOT-51, MC-330, MC-331.	100.
Monochlorodifluoromethane (see Note 9).	105.....	See Note 7.....	do.....	250.
Nitrous oxide.....	See par. (c) of this section.	95.....	do.....	200; see Note 3.
Sulfur dioxide (tanks not over 1,200 gallons water capacity).	125.....	87.5.....	do.....	150; see Note 4.
Sulfur dioxide (tanks over 1,200 gallons water capacity).	125.....	87.5.....	do.....	125; see Note 4.
Sulfur dioxide (optional portable tank 1,000-2,000 pounds water capacity, fusible plug).	125.....	See Note 6.....	DOT-51.....	225.
Vinyl chloride.....	84 (see Note 13) ...	See Note 7.....	MC-330, MC-331...	150.
Vinyl fluoride, inhibited.....	66.....	do.....	do.....	250; see Note 11.

NOTE 1: Maximum filling density for liquefied gases is hereby defined as the percent ratio of the weight of gas in the tank to the weight of water that the tank will hold. For determining the water capacity of the tank in pounds, the weight of a gallon (231 cubic inches) of water at 60° F. in air shall be 8.32826 pounds.

NOTE 2: See § 173.32 for authority to use other portable tanks.

NOTE 3: If cargo tanks and portable tank containers for carbon dioxide and nitrous oxide are designed to comply with the requirements of the ASME Code for Low Temperature Operation, the design pressure may be reduced to 100 p.s.i.g. or the controlled pressure, whichever is greater.

NOTE 4: In the design of tanks for sulfur dioxide and chlorine a corrosion allowance of 20 percent or 0.10 inch, whichever is less, must be added to the metal thickness. In chlorine tanks the wall thickness must be at least five-eighths inch, including corrosion allowance.

NOTE 5: Unlagged cargo tanks and portable tank containers for liquid anhydrous ammonia may be filled to 87.5 percent by volume provided the temperature of the anhydrous ammonia being loaded into such tanks is determined to be not lower than 30° F. or provided the filling of such tanks is stopped at the first indication of frost or ice formation on the outside surface of the tank and is not resumed until such frost or ice has disappeared.

NOTE 6: Tanks equipped with fusible plugs must be filled by weight.

NOTE 7: Tanks must be filled by weight.

NOTE 8: Chlorine cargo tank motor vehicles may be shipped only if the contents are to be unloaded at one unloading point.

NOTE 9: This gas may be transported in authorized cargo tanks and portable tanks marked "DISPERSANT GAS," or "REFRIGERANT GAS."

NOTE 10 [Reserved]

NOTE 11: MC 330 or MC 331 cargo tanks must be insulated. Cargo tanks must meet all of the following requirements. Each tank must be designed for a service temperature no higher than minus 100°F. and must comply with the low-temperature requirements of the ASME Code. The maximum allowable transportation distance before venting will occur, must be that normally accomplished within the holding time of the cargo tank as loaded with an added margin of 100 percent of the normal travel time. However, if the normal travel time exceeds 24 hours, the maximum allowable transportation distance before venting will occur may be that normally accomplished within the holding time of the cargo tank with an added margin of 24 hours. Before transportation in an empty condition each cargo tank having previously transported inhibited vinyl fluoride must have been drained and vented or blown down sufficiently so that there will be no venting during movement of the empty tank. Shipments by common motor carrier must be specifically approved by the Office of Hazardous Materials Operations (OHMO).

NOTE 12: No aluminum, copper, silver, zinc, or alloy of any of these metals shall be used in the cargo tank construction where it can come into contact with the lading.

NOTE 13: All parts of valves and safety devices in contact with contents of tank must be of a metal or other material suitably treated if necessary, which will not cause formation of any acetylides.

NOTE 14: Specifications MC 330 and MC 331 cargo tanks constructed of other than quenched and tempered steel "(NQT)" are authorized for all grades of anhydrous ammonia. Specifications MC 330 and MC 331 cargo tanks constructed of quenched and tempered steel "(QT)" (see marking requirements of § 172.328(c) of this subchapter) are authorized for anhydrous ammonia having a minimum water content of 0.2 percent by weight. Any tank being placed in anhydrous ammonia service or a tank which has been in other service or has been opened for inspection, test, or repair, must be cleaned of the previous product and must be purged of air before loading. See § 172.203(h) of this subchapter for special shipping paper requirements.

NOTE 15: Specifications MC 330 and MC 331 cargo tanks constructed of other than quenched and tempered steel "(NQT)" are authorized for all grades of liquefied petroleum gases. Only grades of liquefied petroleum gases determined to be "noncorrosive" are authorized in Specification MC 330 and MC 331 cargo tanks constructed of quenched and tempered steel "(QT)". "Noncorrosive" means the corrosiveness of the gas does not exceed the limitations for classification 1 of the ASTM Copper Strip Classifications when tested in accordance with ASTM D1838-64, "Copper Strip Corrosion by Liquefied Petro-

leum (LP) Gases." (For (QT) and (NQT) marking requirements see § 172.328(c) of this subchapter. For special shipping paper requirements, see § 172.203(h) of this subchapter.)

NOTE 16: Specifications MC 330 and MC 331 cargo tanks must be equipped with emergency discharge controls that comply with § 178.337-11(c) of this subchapter.

NOTE 17: Specifications MC 330 and MC 331 cargo tanks, with a design service pressure of 250 p.s.i.g., built in compliance with the Federal ICC or Federal DOT regulations at the time of manufacture, which meet all other design and testing requirements specified by § 177.824 for cargo tanks in anhydrous ammonia service, and which have been in anhydrous ammonia service in Illinois before February 1, 1979, may continue to be used in such service. No cargo tank that has not been in anhydrous ammonia service in Illinois before February 1, 1979, may be placed in such service in Illinois after that date unless it meets all requirements of the specification, including a minimum design service pressure of 265 p.s.i.g.

(b) Maximum permitted filling densities for cargo and portable tank containers for transportation of butadiene, inhibited, and liquefied petroleum gas are as follows:

Maximum specific gravity of the liquid material at 60° F.	Maximum permitted filling density in percent of the water-weight capacity of the tanks		Maximum permitted filling density by volume
	1200 gallons or less	Over 1200 gallons	
	Percent	Percent	
0.473-0.480	38	41	See Note 1.
0.481-0.488	39	42	
0.489-0.495	40	43	
0.496-0.503	41	44	
0.504-0.510	42	45	
0.511-0.519	43	46	
0.520-0.527	44	47	
0.528-0.536	45	48	
0.537-0.544	46	49	
0.545-0.552	47	50	
0.553-0.560	48	51	See Note 1
0.561-0.568	49	52	
0.569-0.576	50	53	
0.577-0.584	51	54	
0.585-0.592	52	55	
0.593-0.600	53	56	
0.601-0.608	54	57	
0.609-0.617	55	58	
0.618-0.626	56	59	
0.627 and over	57	60	

NOTE 1: Same filling density as permitted by weight, except when using fixed length dip tube or other fixed maximum liquid level indicators (paragraph (f) of this section), in which case the maximum permitted filling density shall not exceed 97 percent of the maximum permitted filling density by weight contained in the table.

(1) *Odorization.* All liquefied petroleum gas shall be effectively odorized as required in Note 2 of this paragraph to indicate positively, by a distinctive odor, the presence of gas down to a concentration in air of not over one-fifth the lower limit of combustibility: *Provided, however,* That odorization is not required if harmful in the use or further processing of the liquefied petroleum gas, or if odorization will serve no useful purpose as a warning agent in such use or further processing.

NOTE 1: The lower limits of combustibility of the more commonly used liquefied petroleum gases are: Propane, 2.15 percent; butane, 1.55 percent. These figures represent volumetric percentages of gas-air mixtures in each case.

NOTE 2: The use of 1.0 pound of ethyl mercaptan, 1.0 pound of thiophane, or 1.4 pounds of amyl mercaptan per 10,000 gallons of liquefied petroleum gas shall be considered sufficient to meet the requirements of § 173.315(b)(1). This note does not exclude the use of any other odorant in sufficient quantity to meet the requirements of § 173.315(b)(1).

(c) The loading of liquefied gases into cargo tanks and portable tank containers shall be determined by weight or by suitable liquid level gauging device. In either case the liquid portion of the gas shall not fill the tank at 105° F. if the tank be lagged, nor at 115° F. if the tank be unlagged, except that this requirement shall be waived for the shipment of carbon dioxide and nitrous oxide in tanks (which are required to be equipped with suitable pressure controlling devices) which may be charged to a level corresponding to 95 percent of the volumetric capacity of the tank.

1) The vapor pressure (psig) at 115° F. must not exceed the design pressure of the cargo tank or portable tank container.

(d) If the loading of cargo tanks and portable tank containers with liquefied gases is to be determined by weight, the gross weight shall be checked after the filling line is disconnected in each instance. The gross weight shall be calculated from the tank capacity and tare weight set forth on the metal plate required by the specification, and the maximum filling density permitted for the material being loaded into the tank as set forth in the table, paragraph (a) (1) of this section.

(e) If the loading of cargo tanks and portable tank containers with liquefied gases is to be determined by adjustable liquid level device, each tank and each compartment thereof shall have a thermometer well, so that the internal liquid temperature can easily be determined, and the amount of liquid in the tank shall be corrected to a 60° F. basis. Liquid levels shall not exceed a level corresponding to the maximum filling density permitted for the material being loaded into the tank as set forth in the table in paragraph (a) (1) of this section.

(f) When the loading of cargo tanks and portable tank containers with liquefied gases is determined only by fixed length dip tube or other fixed maximum liquid level indicator, the device shall be arranged to function at a level not to exceed the maximum permitted volume prescribed by the table, paragraph (a) (1) of this section. Loading shall be stopped when the device functions.

(g) [Reserved]

(h) Each cargo tank and portable tank, except a tank filled by weight, must be equipped with one or more of the gauging devices described in the following table which indicate accurately the maximum permitted liquid level. Additional gauging devices may be installed but may not be used as primary controls for filling of cargo tanks and portable tanks. Gauge glasses are not permitted on any cargo tank or portable tank. Primary gauging devices used on cargo tanks of less than 3500 gallons water capacity are exempt from the longitudinal location requirements specified in subparagraphs (2) and (3) of this paragraph provided: (1) The tank length does not exceed three times the tank diameter; and (2) the cargo tank is unloaded within 24 hours after each filling of the tank.

Kind of gas	Permitted gauging device
Anhydrous ammonia	Rotary tube; adjustable slip tube; fixed length dip tube.
Anhydrous dimethylamine	None.
Anhydrous monomethylamine	None.
Anhydrous trimethylamine	None.
Aqua ammonia solution containing anhydrous ammonia	Rotary tube; adjustable slip tube; fixed length dip tube.
Butadiene, inhibited	Rotary tube; adjustable slip tube; fixed length dip tube.
Carbon dioxide, liquefied	Rotary tube; adjustable slip tube; fixed length dip tube.
Chlorine	None.
Dichlorodifluoromethane	None.
Dichlorodifluoromethane and difluoroethane mixture (constant boiling mixture)	None.
Dichlorodifluoromethane-dichlorotetrafluoroethane mixture	None.
Dichlorodifluoromethane-monofluorotrichloromethane mixture	None.
Difluoroethane	None.
Difluoromonochloroethane	None.
Dimethyl ether	None.
Hexafluoropropylene	None.
Liquefied petroleum gases	Rotary tube; adjustable slip tube; fixed length dip tube.
Methyl chloride	Fixed length dip tube.
Methyl mercaptan	Rotary tube; adjustable slip tube; fixed length dip tube.
Monochlorodifluoromethane	None.
Nitrous oxide	Rotary tube; adjustable slip tube; fixed length dip tube.
Methylacetylenepropadiene, stabilized	Rotary tube; adjustable slip tube; fixed length dip tube.
Sulfur dioxide	Fixed length dip tube.
Vinyl chloride	None.
Vinyl fluoride, inhibited	None.

(1) The design pressure of the liquid level gauging devices shall be at least equal to the design pressure of the tank.

(2) If the primary gauging device is adjustable, it must be capable of adjustment so that the end of the tube will be in the location specified in subparagraph (3) of this paragraph for at least one of the loadings to be transported, at the filling level corresponding to an average loading temperature. Exterior means must be provided to indicate this adjustment. The gauging device must be legibly and permanently marked in increments not exceeding 20 Fahrenheit degrees (or not exceeding 25 p.s.i.g. on tanks for carbon dioxide or nitrous oxide), to indicate the maximum levels to which the tank may be filled with liquid at temperatures above 20° F. However, if it is not practicable to so mark the gauging device,

this information must be legibly and permanently marked on a plate affixed to the tank adjacent to the gauging device.

(3) A dip tube gauging device consists of a pipe or tube with a valve at its outer end with its intake limited by an orifice not larger than 0.060 inch in diameter. If a fixed length dip tube is used, the intake must be located midway of the tank both longitudinally and laterally and at maximum permitted filling level. In tanks for liquefied petroleum gases, the intake must be located at the level reached by the lading when the tank is loaded to maximum filling density at 40° F.

(4) Each opening for a pressure gauge, except on a tank used exclusively for the transportation of carbon dioxide or nitrous oxide, must be restricted at or inside the tank by an orifice no larger than 0.060 inch in diameter.

(i) Each tank must be provided with one or more safety relief devices which, unless otherwise specified in this Part, must be safety relief valves of the spring-loaded type. Each valve must be arranged to discharge upward and unobstructed to the outside of the protective housing to prevent any impingement of escaping gas upon the tank. For each chlorine tank the protective housing must be in compliance with the requirements set forth in the applicable specification.

(1) Safety relief valves on each tank must have a total relieving capacity as determined by the flow formulas contained in CGA Pamphlet S-1.2. Safety relief valves must have a total relieving capacity sufficient to prevent a maximum pressure in the tank of more than 120 percent of the design pressure. For an insulated tank the required relieving capacity of the relief valves must be the same as for an uninsulated tank, unless the insulation will remain in place and will be effective under fire conditions. In this case, each insulated tank must be covered by a sheet metal jacket of not less than 16 gauge thickness. An MC 330 cargo tank that has safety relief valves sized by Fetterly's formula dated November 27, 1928, may be continued in service. Copies of this formula may be obtained from the Bureau of Explosives.

(2) Each safety relief valve must be arranged to minimize the possibility of tampering. If the pressure setting or adjustment is external to the valve, the safety relief valve must be provided with

means for sealing the adjustment and it must be sealed.

(3) Each safety relief valve on a tank must be set to start-to-discharge at pressure no higher than 110 percent of the tank design pressure and no lower than the design pressure specified in paragraph (a)(1) of this section for the gas transported.

(4) Each safety relief valve must be plainly and permanently marked with the pressure in p.s.i.g. at which it is set to discharge, with the actual rate of discharge of the device in cubic feet per minute of the gas or of air at 60° F. and 14.7 p.s.i.a., and with the manufacturer's name or trade name and catalog number. The start-to-discharge valve must be visible after the valve is installed. The rated discharge capacity of the device must be determined at a pressure of 120 percent of the design pressure of the tank.

(5) Each safety relief valve must have direct communication with the vapor space in the tank.

(6) Each connection to a safety relief valve must be of sufficient size to provide the required rate of discharge through the safety relief valve.

(7) No shut-off valve may be installed between a safety relief valve and the tank except in cases where two or more safety relief valves are installed on the same tank, and one or more safety shut-off valves are arranged to always provide the required relief capacity through at least one of the safety relief valves.

(8) Each safety relief valve outlet must be provided with a protective device to prevent the entrance and accumulation of dirt and water. This device must not impede flow through the valve.

(9) On tanks for carbon dioxide or nitrous oxide, each safety relief device must be installed and located so that the cooling effect of the contents will not prevent the effective operation of the device. In addition to the required safety relief valves, these tanks may be equipped with one or more pressure controlling devices.

(10) Each tank for carbon dioxide also may be equipped with one or more frangible disc devices set to function at a pressure not over two times nor less than 1.5 times the design pressure of the tank.

(11) Each portion of connected liquid piping or hose that can be closed at both ends must be provided with a safety relief valve without an intervening shut-

off valve to prevent excessive hydrostatic pressure that could burst the piping or hose.

(12) Subject to conditions of paragraph (a)(1) of this section for the methyl chloride and sulfur dioxide optional portable tanks, one or more fusible plugs approved by the Bureau of Explosives may be used on these tanks in place of safety relief valves of the spring-loaded type. The fusible plug or plugs must be in accordance with CGA Pamphlet S-1.2, to prevent a pressure rise in the tank of more than 120 percent of the design pressure. If the tank is over 30 inches long, each end must have the total specified safety discharge area.

(13) A safety relief valve on a chlorine tank motor vehicle must conform to one of the following standards of The Chlorine Institute, Inc.: Type 1½ JQ225, Dwg. H51970, dated October 7, 1968; or Type 1½ JQ225, Dwg. H50155, Revision A, dated April 28, 1969.

(j) Storage containers for liquefied petroleum gas for permanent installation on consumer premises may be shipped by private motor carrier only under the following conditions:

(1) Each container must be constructed in compliance with the requirements of the ASME Code (containers built in compliance with earlier editions starting with 1943 are authorized) and must be marked to indicate compliance in the manner specified by the respective Code.

(2) Each container must be equipped with safety devices in compliance with the requirements for safety devices on containers as specified in NFPA Pamphlet No. 58.

(3) The containers shall be so braced or otherwise secured on the vehicle as to prevent relative motion while in transit. Valves or other fittings shall be adequately protected against injury during transportation. (See § 177.834 (g) of this subchapter.)

(4) Except as provided in subparagraph (j) (5) of this paragraph, containers shall not be shipped when charged with liquefied petroleum gas to more than 5 percent of their water capacity.

(5) Storage containers of less than 1042 pounds water capacity (125 gallons) may be shipped when charged with liquefied petroleum gas in compliance with DOT filling density.

(k) For manifolding of cargo tank containers see § 173.301(d).

(1) Anhydrous ammonia must not be offered for transportation or transported in specification MC 330 and MC 331 cargo tanks constructed of quenched and tempered ("QT") steel except as provided in this paragraph.

(1) The ammonia must have a minimum water content of 0.2 per cent by weight. Any addition of water must be made using steam condensate, de-ionized, or distilled water.

(2) Except as otherwise provided in this paragraph, each person offering for transportation or transporting anhydrous ammonia shall perform a periodic analysis for prescribed water content in the ammonia. The analysis must be performed—

(i) From a sample of the ammonia in storage taken at least once every 7 days, or each time ammonia is added to the storage tanks, whichever is less frequent; or

(ii) At the time the cargo tanks are loaded, then a sample of the ammonia taken from at least one loaded cargo tank out of each 10 loads, or from one cargo tank every 24 hours, whichever is less frequent; or

(iii) At the same frequency as described in subparagraph (ii) of this paragraph, from a sample taken from the loading line to the cargo tank.

(3) If water is added at the time of loading—

(i) The sample for analysis must be taken from a point in the loading line between the water injection equipment and the cargo tank; and

(ii) Positive provisions must be made to assure water injection equipment is operating.

(4) If water injection equipment becomes inoperative, suitable corrective maintenance must be performed after which a sample from the first loaded cargo tank must be analyzed for prescribed water content.

(5) The analysis method for water content must be as prescribed in CGA Pamphlet G-2.2, titled "Tentative Standard Method for Determining Minimum of 0.2 per cent water in Anhydrous Ammonia," 1975 edition.

(6) Records indicating the results of the analysis taken, as required by this paragraph, must be retained for 2 years and must be open to inspection by representative of the Department.

(7) Each person receiving anhydrous ammonia containing 0.2 per cent water by weight may offer for transportation or

transport that ammonia without performing the prescribed analysis for water content provided—

(i) The ammonia received was certified as containing 0.2 per cent water as prescribed in §§ 173.427(a)(3) and 177.817(a)(1) of this subchapter; and

(ii) The amount of water in the ammonia has not been reduced by any means.

§ 173.316 Liquefied hydrogen.

(a) Liquefied hydrogen (minimum 95 percent parahydrogen) must be charged into specification containers as follows:

(1) [Reserved]

(2) Specification 4L (§ 178.57 of this subchapter) cylinders, in accordance with the following requirements:

(i) Service temperature: minus 423° F. or colder.

(ii) Maximum filling density, based on cylinder capacity at minus 423° F.: 6.7 percent.

(iii) Pressure must be limited by a pressure-controlling valve set to limit pressure to not more than 17 psi.

(iv) Each cylinder must be constructed, insulated, and maintained so that during transportation the total rate of venting shall not exceed 30 standard cubic feet of hydrogen per hour.

(v) In addition to the marking required by § 178.57-20 of this chapter, the total rate of venting in standard cubic feet per hour shall be marked on the top of each head or valve protection band in letters at least one-half inch high as follows: "VENT RATE ** CFH" with the stars replaced by figures signifying the standard hydrogen venting rate for the cylinder.

(vi) Transportation is limited to private and contract motor carriers under conditions specified in § 177.840(a)(1) of this subchapter.

(vii) Pressure in each cylinder must be reduced to 8 psig or lower at least once within 4 hours before the beginning of transportation.

Subpart H—Poisonous Materials, Etiologic Agents, and Radioactive Materials; Definitions and Preparation

§ 173.325 Classes of poisonous materials.

(a) Poisonous materials for the purpose of this subchapter are divided into three groups according to the degree of hazard in transportation.

- (1) Poison A.
- (2) Poison B.
- (3) Irritating material. —

§ 173.326 Poison A.

(a) For the purpose of this subchapter extremely dangerous poisons, class A, are poisonous gases or liquids of such nature that a very small amount of the gas, or vapor of the liquid mixed with air is dangerous to life. This class includes the following:

- (1) Bromacetone.
- (2) Cyanogen.
- (3) Cyanogen chloride containing less than 0.9 percent water.
- (4) Diphosgene.
- (5) Ethyldichlorarsine.
- (6) Hydrocyanic acid (see Note 1 of this paragraph).
- (7) [Reserved]
- (8) Methyldichlorarsine.
- (9) [Reserved]
- (10) Nitrogen peroxide (tetroxide).
- (11) [Reserved]
- (12) Phosgene (diphosgene).
- (13) Nitrogen tetroxide-nitric oxide mixtures containing up to 33.2 percent weight nitric oxide.

NOTE 1: Diluted solutions of hydrocyanic acid of not exceeding 5 percent strength are classed as poisonous articles, class B (see § 173.343).

§ 173.327 General packaging requirements for Poison A materials.

(a) Cylinders must be maintained in compliance with the requirements of § 173.34. Valves must be capable of withstanding the test pressure of the cylinders and must have taper-threaded connections directly to the cylinders (no bushings or straight-threaded connections of valves to cylinders permitted). For corrosive commodities, valves may be of the packed type provided the assembly is made gas-tight by means of a seal cap with compatible gasketed joint to the valve body or to the cylinder to prevent loss of commodity through or past the packing; otherwise the valves must be of the packless type with nonperforated diaphragms and handwheels. Each valve outlet must be sealed by a threaded cap or a threaded solid plug. The outlet caps and plugs, luting, and gaskets must be compatible with each other, the valve assembly, and the lading.

(1) The pressure of the poison gas at 130° F. must not exceed the service pressure of the cylinder. Cylinders must not be liquid full at 130° F.

(2) Cylinders packed in boxes must have adequate protection for valves. Box and valve protection must be of strength sufficient to protect all parts of cylinders and valves from deformation or breakage resulting from a drop of at least 6 feet onto a concrete floor, impacting at the weakest point. A cylinder not overpacked in a box must be equipped with a protective cap or other means of valve protection which must be capable of preventing damage to or distortion of the valve if it were subjected to an impact test as follows: The cylinder, prepared as for shipment, is allowed to fall from an upright position with the side of the cap or other valve protection striking a solid steel object projecting not more than 6 inches above the floor level.

(b) Closing and cushioning. All containers must be tightly and securely closed. Inside containers must be cushioned as prescribed, or in any case when necessary to prevent breakage or leakage.

(c) No class A poisons in cargo tanks. No "extremely dangerous poison, class

A." may be loaded into or transported in any cargo tank.

(d) It shall not be permissible to transport class A poison if there be any inter-connecting means of any character between the containers.

(e) Unless otherwise specified in this subchapter, packaging used for the transportation of any Poison A material may not be completely filled. Sufficient outage must be provided so that the packaging will not be liquid full at 130° F. (55° C.).

§ 173.328 Poison A materials not specifically provided for.

(a) Poison A materials, as defined in § 173.326, other than those for which special packaging requirements are prescribed in this part, must be packaged as follows:

(1) Spec. 33¹ or 3D (§ 178.41 of this chapter). Metal cylinders of not over 125 pounds water capacity (nominal). Gaskets if used between the protection cap and neck of cylinder must be renewed for each shipment even though they may appear to be in good condition. Cylinders not fitted with valve protection extension ring must be packed in wooden boxes complying as to construction, marking, and labeling, with the requirements of § 173.25.

(2) Specification 3A1800, 3AA1800 or 3E1800 (§§ 178.36, 178.37, 178.42) cylinders.

(i) Specifications 3A and 3AA cylinders must not exceed 125 pounds water capacity (nominal). Cylinders must have valve protection or be packed in strong wooden or metal boxes as described in § 173.327(a)(2) of this chapter.

(ii) Specification 3E1800 cylinders must be packed in strong wooden or metal boxes.

¹ Use of existing cylinders authorized, but new construction not authorized.

§ 173.329 Bromacetone; chlorpicrin and methyl chloride mixtures; chlorpicrin and nonflammable, nonliquefied compressed gas mixtures.

(a) Bromacetone, must be packed in specification containers as follows:

(1) As prescribed in § 173.328.

(2) Spec. 15A, 15B, 15C, or 16A (§§ 178.168, 178.169, 178.170, or 178.185 of this subchapter). Wooden boxes with inside glass bottles or tubes in hermetically sealed metal cans in corrugated fiber-board cartons, spec 2C (§ 178.22 of this subchapter). Bottles must contain not over 1 pound of liquid each, must be filled to not over 95 percent capacity, must be tightly and securely closed, and must be cushioned in cans with at least ½ inch of absorbent material. Cans must be made of metal at least 32 gauge United States standard. Total amount of liquid in outside box must not exceed 24 pounds.

(b) *Chlorpicrin and methyl chloride mixtures.* Chlorpicrin and methyl chloride mixtures, in addition to containers prescribed in § 173.328, when offered for transportation by carriers by rail freight, highway, or water, may be shipped in specification containers as follows:

(1) Specification 3A, 3AA, 3B, 3C, 3E, 4A, 4E, 4BA, 4BW, or 4C (§§ 178.36, 178.37, 178.38, 178.40, 178.42, 178.49, 178.50, 178.51, 178.61, or 178.52 of this subchapter) cylinders having not over 250 pounds water capacity (nominal). Valves or other closing devices must be protected to prevent damage in transit, by screw-on metal caps or by packing the cylinders in strong boxes or crates. Cylinders having a wall thickness of less than 0.10 inch must be packed in boxes or crates (see § 173.25).

(c) *Chlorpicrin and nonflammable, nonliquefied compressed gas mixtures.* Chlorpicrin and nonflammable, nonliquefied compressed gas mixtures, in addition to containers prescribed in § 173.328, when offered for transportation by carriers by rail freight, highway, or water, must be shipped in specification containers as follows:

(1) Specification 3A, 3AA, 3B, 3C, 3E, 4A, 4B, 4BA, 4BW, or 4C (§§ 178.36, 178.37, 178.38, 178.40, 178.42, 178.49, 178.50, 178.51, 178.61, or 178.52 of this subchapter) cylinders having not over 250 pounds water capacity (nominal). Valves or other closing devices must be protected to prevent damage in transit,

by screw-on metal caps or by packing the cylinders in strong boxes or crates. Cylinders having a wall thickness of less than 0.10 inch must be packed in boxes or crates (see § 173.25).

§ 173.330 Chemical ammunition.

(a) Projectiles, shells, bombs, and grenades containing Poison A materials but not equipped or packaged with ignition elements, bursting charges, detonating fuzes, or explosive components, may be shipped only by, for, or to the Department of Defense. Each shipment must be packaged, marked, and labeled as required by their regulations. Each package must be labeled with POISON GAS label marked "NONEXPLOSIVE" and also marked with the proper shipping name. (See §§ 173.53(r) and 173.59 for explosive chemical ammunition.)

(b) Chemical ammunition containing poisonous liquids or gases, class A, must not be offered for transportation by rail express.

§ 173.331 Gas identification sets.

(a) Gas identification sets containing Poison A materials, irritating materials, and chlorine must be packaged in specification 15A or 15B (§§ 178.168, 178.169 of this subchapter). Wooden boxes, under the following conditions:

(1) Gas identification sets containing Poison A materials and irritating materials may be shipped in amounts not exceeding 6 cubic centimeters, if a liquid, or 5 grams, if a solid, when mixed with or absorbed in activated charcoal or silica gel, or other absorbent medium, and packed in strong glass bottles of not less than 4 fluid ounces capacity. The Poison A materials and chlorine may be snipped if the gas itself is absorbed in activated charcoal or silica gel, or other absorbent medium, and packed in the same type 4-ounce bottles as described above. Each bottle as herein specified must be surrounded with appropriate absorbent cushioning material, and enclosed in a hermetically sealed metal can. Each can must be surrounded on all sides by at least 1 inch of dry, fine sawdust or wood pulp. The cans must be packed in an out-

side wooden box, specification 15A or 15B (§§ 178.168, 178.169 of this subchapter). The bottles must be closed with ground-in glass stoppers securely fastened. The cushioning material around the bottle must be at least 1 inch thick. The cans must be made from metal of thickness not less than 30 gauge, United States standard. There must be not more than a total of 100 grams or cubic centimeters or a combination of both, in each outside wooden box.

(b) Gas identification sets containing Poison A materials and irritating materials must be packaged as follows:

(1) The liquids or liquefied gases in hermetically sealed glass tubes containing not to exceed 40 cubic centimeters each. Each tube must be securely cushioned and packed in an individual mailing tube with screw-thread metal cover. Not more than 12 such mailing tubes, cushioned with corrugated fiberboard, may be packed in a closed fiberboard container, not to exceed 4 such fiberboard containers, containing an aggregate of not to exceed 48 glass tubes cushioned and packed in an outside steel cylinder of not less than 0.145-inch wall thickness, which is closed by a plate, bolted to a flange welded to cylinder wall. Suitable gasket must be placed between flange and head plate, and closure must prevent leakage of any gas.

(c) Gas identification training sets containing Poison A materials and irritating materials must be packaged as follows:

(1) The Poison A materials and irritating material, in amounts not exceeding 5 cubic centimeters, if a liquid, or 20 grams, if a solid, when mixed with or absorbed in activated charcoal, silica gel, crepe rubber, or other absorbent medium, must be packed in strong glass bottles of not less than 2 fluid ounces capacity, equipped with a polyethylene liner; each bottle as herein specified must have a metal screw-cap closure, equipped with a built-in compression type spring and an insert in the opening of the bottle to match so that when tightened an airtight seal is obtained. Twelve bottles, containing articles as described in this paragraph and not exceeding 100 cubic centimeters or grams, or a combination of both, must be placed in a modified styrene plastic carrying case, in three rows of four bottles each and fitted with a fiberboard cell or separator. The

void space around the individual bottles, and around all interior sides of the carrying case, must be filled with dry, fine sawdust or vermiculite. A sheet of sponge rubber must be fitted to the inside of the top and bottom of the carrying case to provide additional cushioning and insure a snug fit of the bottles when the top is secured. The carrying case must be fitted into a snug fitting fiberboard box, domestic type. The case must then be packed in a nailed wooden box, specification 15A or 15B (§§ 178.168, 178.169 of this subchapter), which must be fitted with a waterproof case liner.

§ 173.332 Hydrocyanic acid, liquid (prussic acid) and hydrocyanic acid liquefied.

(a) Hydrocyanic acid, liquid (prussic acid) and hydrocyanic acid liquefied, must be packed in specification containers as follows:

(1) As prescribed in § 173.328.

(2) Spec. 3A480, 3AA480, or 3A480X (§§ 178.36, 178.37, or 178.43 of this subchapter). Metal cylinders of not over 278 pounds water capacity (nominal); valve protection cap must be used and be at least $\frac{3}{16}$ inch thick, gas-tight, with $\frac{3}{16}$ inch faced seat for gasket and with United States standard form thread; the cap must be capable of preventing injury or distortion of the valve when it is subjected to an impact caused by allowing cylinder, prepared as for shipment, to fall from an upright position with side of cap striking a solid steel object projecting not more than 6 inches above floor level.

(b) Cylinders must be charged with not more than 0.6 pound of liquid for 1-pound water capacity of cylinder. Each filled cylinder must be tested for leakage before shipment and must show absolutely no leakage; this test must consist in passing over the closure of the cylinder, without the protection cap attached, a piece of Guignard's sodium picrate paper to detect any escape of hydrocyanic acid from the cylinder. Other equally efficient test methods may also be used in lieu of the picrate paper.

(c) Liquid hydrocyanic acid completely absorbed in inert material may also be shipped in specification containers as follows:

(1) Spec. 15A (§ 178.168 of this subchapter). Wooden boxes with inside containers consisting of metal cans, spec. 2N

(§ 178.32 of this subchapter), not over 14 pounds water capacity each. The liquid contents of each can must not exceed 0.33 pound of liquid for 1-pound water capacity of the can. Each can containing 4 ounces or more of liquid must be fitted with fiber caps not less than 0.08 inch thick flanged about 1 inch and fitting snugly over each end of the can. Each can must be tested for leakage after being filled and again after being maintained at ordinary room temperature for a period of at least three weeks. Each can must have its outer surface protected against rust by the use of enamel or lacquer, or each can must be completely wrapped in waterproof paper.

(2) The box lining must consist of not more than two pieces of waterproof paper, one piece completely surrounding the contents and running lengthwise of the box, and the other piece completely surrounding the contents and running crosswise of the box. In each instance, the wrapping must overlap at least 4 inches.

(3) Spec. 12B (§ 178.205) of this subchapter). Fiberboard boxes, constructed in accordance with requirements for a gross weight of 65 pounds but having a gross weight of not over 70 pounds, with inside containers consisting of metal cans, spec. 2N (§ 178.32 of this subchapter). The liquid contents of each can must not exceed 0.33 pound of liquid for 1-pound water capacity of the can and the total weight of liquid in each can must not exceed 41 ounces. Each can must be tested for leakage after being filled and again after being maintained at ordinary room temperature for a period of at least three weeks. Each can must have its outer surface protected against rust by the use of enamel or lacquer. Not more than twelve cans shall be packed in the outside fiberboard box and each can shall be separated from the other by 200-pound minimum test fiberboard partitions. Each box shall be provided with 200-pound minimum test fiberboard liner and top and bottom pads of the same material. In addition to the required closure of the boxes, two metal straps measuring $\frac{1}{2}$ inch by .015 inch must be applied around the girth of each box.

§ 173.333 Phosgene or diphosgene.

(a) Phosgene or diphosgene must be packed in specification containers as follows:

(1) As prescribed in § 173.328, the filling density (see § 173.304(a)(2) Table Note 1) must not exceed 125 percent and a cylinder must not contain more than 150 pounds of phosgene.

(2) Specification 106A500X (§§ 179.-300, 179.301 of this subchapter) tanks. Authorized only for phosgene. Each tank must be approved by the Bureau of Explosives. Tanks must not be equipped with safety devices of any type. Outage must be sufficient to prevent tanks from becoming liquid full at 130° F. (55° C.). (See § 177.834(m) of this subchapter for special requirements for highway shipments.)

(b) Each filled cylinder must be tested for leakage before shipment and must show absolutely no leakage; this test must consist in immersing the cylinder and valve, without the protection cap attached, in a bath of water at a temperature of approximately 150° F. for at least thirty minutes, during which time frequent examinations must be made to note any escape of gas. The valve of the cylinder must not be loosened after this test and before shipment.

§ 173.334 Organic phosphates mixed with compressed gas.

(a) Hexaethyl tetraphosphate, parathion, tetraethyl dithio pyrophosphate, tetraethyl pyrophosphate, or other Poison B organic phosphate, n.o.s. (including a compound or mixture), may be mixed with a compressed gas which must be nonflammable. This mixture must not contain more than 20 percent by weight of organic phosphate and must be packaged as follows:

(1) Specification 3A240, 3AA240, 3B240, 4A240, 4BA240, or 4BW240 (§§ 178.36, 178.37, 178.38, 178.49, 178.50, 178.51, 178.61, of this subchapter) cylinders meeting the following requirements:

(i) Each cylinder may be charged with not more than 10 pounds of the mixture, to a maximum filling density of not more than 80 percent of the water capacity;

(ii) Each cylinder must be charged in compliance with § 173.301 (e) and (f);

(iii) No cylinder may be equipped with an education tube or a fusible plug;

(iv) No cylinder may be equipped with any valve unless the valve is a type approved by the Department for this installation.

(v) Cylinders must be overpacked in a box so arranged to protect each valve or other closing device from damage. No more than four cylinders may be packed in a box except that in a wooden box, up to 12 cylinders may be so packed. Each box with its closing device protection must be sufficiently strong to protect all parts of each inside cylinder from deformation or breakage if the completed package were dropped six feet onto solid concrete, impacting at the weakest point.

(b) Cylinders must be packed in strong wooden boxes with valves or other closing devices protected from injury, with not more than twelve cylinders in one outside wooden box. A single-trip outside fiberboard box may be used when not more than four such cylinders are to be shipped in one outside container. Valves must be adequately protected. Box and valve protection must be of strength sufficient to protect all parts of inside containers and valves from deformation or breakage resulting from a drop of at least six feet onto a concrete floor, impacting at the weakest point.

§ 173.335 [Reserved]

§ 173.336 Nitrogen dioxide, liquid; nitrogen peroxide, liquid; and nitrogen tetroxide, liquid.

(a) Nitrogen dioxide, liquid, nitrogen peroxide, liquid, and nitrogen tetroxide, liquid must be packed in specification containers as follows:

(1) As prescribed in § 173.328.

(2) Spec. 3A480 or 3AA480 (§ 178.36 or § 178.37 of this subchapter) or 25.¹ Metal cylinders with valve removed; valve opening to be closed by means of a solid metal plug with tapered thread properly luted to prevent leakage; valve protection cap must be used and be at least $\frac{3}{16}$ inch thick, gastight, with $\frac{3}{16}$ inch faced seat for gasket and with United States standard form thread. Use of this container will be permitted because of the present emergency and until further order of the Department.

(3) Specification 106A500X (§§ 179.-300, 179.301 of this subchapter) tanks. Each tank must be equipped with gas tight

¹ Use of existing cylinders authorized, but new construction not authorized.

valve protection caps which must be approved by the Bureau of Explosives or all valve openings made gas tight by the use of screw plug or screw caps. Tanks must not be equipped with safety devices of any type. Outage must be sufficient to prevent tanks from becoming liquid full at 130° F. (55° C.). (See § 177.834(m) of this subchapter for special requirements for highway shipments.)

§ 173.337 Nitric oxide.

(a) Nitric oxide must be packed in specification containers as follows:

(1) Spec. 3A, 3AA, or 3E1800 (§ 178.36, § 178.37, or § 178.42 of this subchapter) cylinders designed and marked for a service pressure of 1800 pounds per square inch or higher, charged to a pressure of not more than 750 pounds per square inch at 70° F. Cylinders must be equipped with a valve of stainless steel and valve seat of material which will not be deteriorated by contact with nitric oxide or nitrogen dioxide. Containers or valves must not be equipped with safety devices of any type. Valve outlets must be sealed by a solid threaded cap or plug and an inert gasketing material.

(2) Spec. 3E1800 (§ 178.42 of this subchapter) cylinders must be packed in strong wooden boxes of such design as to protect valves from injury or accidental functioning under conditions incident to transportation. Each outside shipping container must be plainly marked "inside containers comply with prescribed specifications."

(3) Spec. 3A and 3AA (§§ 178.36 and 178.37 of this subchapter) cylinders must have their valves protected by metal caps securely attached to the cylinders and of sufficient strength to protect the valves from injury during transit, or by packing in strong wooden boxes of such design as to protect valves from injury or accidental functioning under conditions incident to transportation. Each outside shipping container must be plainly marked "inside containers comply with prescribed specifications."

(4) Specification 106A500X (§§ 179.-300, 179.301 of this subchapter) tanks. Nitric oxide charge in each tank may not exceed 200 p.s.i.g. at 70° F. Each tank must be equipped with gas-tight valve protection caps (see § 179.302 of this subchapter). Each valve outlet must be sealed by a threaded solid plug or a

threaded cap with inert luting or gasket material. Valves must be of stainless steel and the caps, plugs, and valve seats must be of material that will not be deteriorated by contact with nitric oxide or nitrogen dioxide. The tank may not be equipped with any safety relief device.

§ 173.338 [Reserved]

§ 173.343 Poison B.

(a) For the purpose of this subchapter and except as otherwise provided, class B poisons are those substances, liquid or solid (including pastes and semisolids), other than class A poisons or irritating materials, which are known to be so toxic to man as to afford a hazard to health during transportation; or which, in the absence of adequate data on human toxicity, are presumed to be toxic to man because they fall within any one of the following categories when tested on laboratory animals:

(1) *Oral toxicity.* Those which produce death within 48 hours in half or more than half of a group of 10 or more white laboratory rats weighing 200 to 300 grams at a single dose of 50 milligrams or less per kilogram of body weight, when administered orally.

(2) *Toxicity on inhalation.* Those which produce death within 48 hours in half or more than half of a group of 10 or more white laboratory rats weighing 200 to 300 grams, when inhaled continuously for a period of one hour or less at a concentration of 2 milligrams or less per liter of vapor, mist, or dust, provided such concentration is likely to be encountered by man when the chemical product is used in any reasonable foreseeable manner.

(3) *Toxicity by skin absorption.* Those which produce death within 48 hours in half or more than half of a group of 10 or more rabbits tested at a dosage of 200 milligrams or less per kilogram body weight, when administered by continuous contact with the bare skin for 24 hours or less.

(b) The foregoing categories shall not apply if the physical characteristics or the probable hazards to humans as shown by experience indicate that the substances will not cause serious sickness or death. Neither the display of danger or warning labels pertaining to use nor the toxicity tests set forth above shall prejudice or prohibit the exemption of any substances

from the provisions of this chapter.

§ 173.344 General packaging requirements for Poison B liquids.

(a) **Closing and cushioning.** All containers must be tightly and securely closed. Inside containers must be cushioned as prescribed, or in any case when necessary to prevent breakage or leakage.

(b) Packagings containing liquid material may not be completely filled. Outage must be as follows:

(1) For packagings of 110 gallons or less, sufficient outage must be provided so that the packaging will not be liquid full at 130° F. (55° C.).

(2) The proper vacant space (outage) in a shipping container depends on the coefficient of expansion of the liquid and the maximum increase of temperature to which it will be subjected in transit. Outage must be calculated to the total capacity of the container.

(3) [Reserved]

(4) [Reserved]

(5) The outage for tank cars must not be less than 1 percent.

(6) No cargo tank or compartment thereof used for the transportation of any liquid poison shall be completely filled; sufficient space shall be left vacant in every case to prevent leakage from or distortion of any such cargo tank by expansion of the contents due to rise in temperature in transit, and such free space (outage) shall be sufficient in every case so that such cargo tank shall not become entirely filled with the liquid at 130° F.

§ 173.345 Limited quantities of Poison B liquids.

(a) Limited quantities of Poison B liquids for which exceptions are permitted as noted by reference to this section in § 172.101 of this subchapter or as provided in § 173.359(c), in tightly closed inside packagings, securely cushioned when necessary to prevent breakage, are excepted from the specification packaging requirements when packed according to the following paragraphs. In addition, shipments are not subject to Part 172 or Part 177 of this subchapter.

(1) In glass packagings not over 1 quart capacity each, or in metal containers or polyethylene bottles not over 1 gallon capacity each, packed in strong

outside wooden boxes or barrels.

(2) In glass packagings not over 1 pint capacity each, or in metal or polyethylene packagings (other than bags) not over 1 quart capacity each, packed in strong outside fiberboard boxes.

(b) Special exceptions for shipment of certain drugs and medicines in the ORM-D class are prescribed in Subpart N of this Part.

§ 173.346 Poison B liquids not specifically provided for.

(a) Poison B liquid, as defined in § 173.343, other than those for which special requirements are prescribed, must be packaged as follows:

(1) Spec. 5, 5A, 5B, or 5C (§§ 178.80, 178.81, 178.82, or 178.83 of this subchapter). Metal barrels or drums, with openings not exceeding 2.3 inches in diameter.

(2) Spec. 17C or 17E (§§ 178.115 or 178.116 of this subchapter). Metal drums (single-trip containers), with openings not exceeding 2.3 inches in diameter.

(3) Specification 37B (§ 178.132 of this subchapter). Metal drums (single-trip containers), welded side seams, openings not over 2.3 inches in diameter, capacity not over 10 gallons.

(4) Spec. 37A or 37B (§ 175.131 or § 178.132 of this subchapter). Metal drums (single-trip containers), with welded side seams, not over 5 gallons; authorized for pastes only.

(5) [Reserved]

(6) [Reserved]

(7) Spec. 12B (§ 178.205 of this subchapter). Fiberboard boxes with glass or earthenware inside containers not over 1 quart capacity each, or with metal inside containers not over 1 gallon capacity each. Packages containing glass or earthenware containers must not weigh over 65 pounds gross.

(8) Spec. 12D (§ 178.207 of this subchapter). Fiberboard boxes with inside container which must be glass or earthenware not over one gallon each; authorized for not more than 75 pounds gross weight; not to contain more than 4 such inside containers if their capacity is greater than 5 pints each. Use of this container will be permitted because of the present emergency and until further order of the Department.

(9) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 178.168, 178.169, 178.170, 178.185, or

178.190 of this subchapter). Wooden boxes with glass or earthenware inside containers not over 1 gallon capacity each, except that inside containers up to 3 gallons are authorized when only one is packed in each outside container; or with metal inside containers, not over 10 gallons capacity each.

(10) [Reserved]

(11) Cylinders as prescribed for any compressed gas, except acetylene, are also authorized.

(12) Specifications MC 300, MC 301, MC 302, MC 303, MC 304, MC 305, MC 306, MC 307, MC 310, MC 311, or MC 312 (§§ 178.341, 178.342, 178.343 of this subchapter). Tank motor vehicles.

(13) Specification 1A, 1D, or 1E (§§ 178.1, 178.4, 178.7 of this subchapter). Glass carboys in wooden boxes or plywood drums.

(14) Spec. 12B (§ 178.205 of this subchapter). Fiberboard boxes with not more than one inside glass container of not over 1 gallon capacity, securely cushioned. Completed package, with glass container filled with water, when closed for shipment, must be capable of withstanding six four-foot drops onto solid concrete in the order bottom, four sides, and top without breakage.

(15) Spec. 21C (§ 178.224 of this subchapter). Fiber drums, with inside glass containers not over one gallon capacity each.

(16) Spec. 42B, 42C, or 42D (§§ 178.107, 178.108, or 178.109 of this subchapter). Aluminum drums.

(17) Spec. 42E (§ 178.136 of this chapter). Aluminum drums (single-trip).

(18) Spec. 15P or 22C (§ 178.182 or § 178.198 of this subchapter). Glued plywood or wooden box, or plywood drum as prescribed by § 178.198-2(a) of this subchapter, with inside spec. 2T (§ 178.21 of this subchapter) polyethylene container.

(19) Specification 37P (§ 178.133 of this subchapter). Steel drums, not over 5 gallons capacity, with polyethylene liner (non-reusable container). Drums exceeding 1 gallon capacity must be constructed of at least 24-gauge metal. Hole in steel drum body must be suitably plugged. Authorized only for materials that will not react with polyethylene and result in container failure.

(20) Spec. 6D (§ 178.102 of this sub-

chapter). Cylindrical steel overpack with inside Spec. 2S (§ 178.35 of this subchapter) polyethylene container. Authorized only for materials that will not react with polyethylene and result in container failure.

(21) Spec. 12A (§ 178.210 of this subchapter). Fiberboard boxes with not more than one inside glass bottle not over 1-gallon capacity. Shipper must have established that the completed package meets test requirements prescribed by § 178.210-10 of this subchapter.

(22) Spec. 29 (§ 178.226 of this subchapter). Mailing tubes, with polyethylene bottles not over 2 quarts capacity each.

(23) Spec. 42G (§ 178.111 of this subchapter). Aluminum drums.

(24) Specification 12P (§ 178.211 of this subchapter). Fiberboard boxes with inside specification 2U (§ 178.24 of this subchapter) polyethylene containers not over 5 gallons capacity each. Wire staples are not authorized for assembly or closure of boxes, except when polyethylene container is completely enclosed in inside boxes free of wire staples or other projections that could cause failures.

(25) Specification 16A (§ 178.185 of this subchapter). Wirebound wooden box (see § 178.185-22 of this subchapter) with inside specification 2U (§ 178.24 of this subchapter) polyethylene container. The polyethylene container must be separated from the wooden box by a complete corrugated fiberboard liner and top and bottom pads.

(26) Spec. 12B or 12A (§ 178.205 or 178.210 of this subchapter). Fiberboard boxes with inside polyethylene bottles having a minimum wall thickness of 0.015 inch and provided with screw-cap closures, not over 1-gallon capacity each. Except for polyethylene bottles having a minimum wall thickness exceeding 0.015 inch, each bottle shall be enclosed in a box constructed of at least 200-pound test (Mullen or Cady) corrugated fiberboard and not more than four such boxes shall be packed in one outside specification shipping container. When spec. 12A boxes are used, shipper must have established that completed package meets test requirements prescribed by § 178.210-10 of this subchapter.

(27) Specification 51 (§ 178.245 of this subchapter). Portable tank.

§ 173.347 Aniline oil.

(a) Aniline oil must be packed in specification containers as follows:

(1) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 178.168, 178.169, 178.170, 178.185, or 178.190 of this subchapter). Wooden boxes with metal inside containers not over 10 gallons capacity each, or glass bottles not over 1 pound capacity each. Not more than 25 of these bottles shall be packed in any outside container.

(2) [Reserved]

(3) Specification MC 300, MC 301, MC 302, MC 303, MC 304, MC 305, MC 306, or MC 307 (§§ 178.340, 178.341, 178.342 of this subchapter) tank motor vehicles. Bottom outlets on Specification MC 304 cargo tanks must be equipped with valves conforming with § 178.342-5(a) of this subchapter.

(4) Spec. 5, 5A, or 5B (§§ 178.80, 178.81 or 178.82 of this subchapter). Metal barrels or drums. Net weight in 110 gallon drums must not exceed 915 pounds.

(5) Spec. 17C (§ 178.115 of this subchapter). Metal drums (single-trip).

(6) Spec. 17E (§ 178.116 of this subchapter). Metal drums (single-trip) not over 5 gallons capacity each.

(7) Spec. 12B (§ 178.205 of this subchapter). Fiberboard boxes with metal inside containers not over 1 gallon capacity each; not to contain more than 4 such inside containers if their capacity is greater than 5 pints each.

(8) Spec. 12A (§ 178.210 of this subchapter). Fiberboard boxes with inside glass bottles or metal containers not over 1 gallon capacity each. Not more than four inside containers having capacity of 1 gallon each, shall be packed in one outside container. Shipper must have established that completed package meets test requirements prescribed by § 178.210-10 of this subchapter.

(b) Openings in metal barrels or drums must not exceed 2.3 inches in diameter.

(1) Gaskets not less than one-eighth inch thick must be used at bung and filling holes. Gaskets must be made of hard fiber impregnated with glycerin metal-covered cork, impregnated asbestos sheets, or metal-covered asbestos.

(c) Filled drums must be so placed that bungs will be subjected to hydrostatic head of oil contained therein for a period of not less than 12 hours.

(1) The exterior of filled drums must be carefully examined for evidence of aniline oil, any traces of which must be removed by washing off with water or, preferably, weak acetic acid. The space between rolling hoops immediately around the bung should be painted to aid in the detection of leaks at this point.

(d) All returnable drums must bear the following notice, "PREVENT DAMAGE TO FOODSTUFFS OR OTHER FREIGHT. DRAIN THIS DRUM THOROUGHLY. TIGHTEN BUNGS. WITH GASKET SECURELY IN PLACE BEFORE RETURNING. USE NEW GASKETS WHEN NECESSARY. ANILINE OIL STAINS ON THE OUTSIDE OF DRUMS SHOULD BE WASHED OFF WITH WATER OR, PREFERABLY, WEAK ACETIC ACID", shellacked to head of drum near the consignee's name and address.

§ 173.348 Arsenic acid.

(a) Arsenic acid must be packed in specification containers as follows:

(1) As prescribed in § 173.346. When shipped in metal barrels or drums, or tank motor vehicles without lead lining, the arsenic acid must contain not over 0.05 percent nitric acid.

(2) Specification 1A, 1C, or 1D (§§ 178.1, 178.3, 178.4 of this subchapter). Glass carboys in boxes or kegs.

(3) Specification 12A or 12B (§§ 178.210, 178.205 of this subchapter). Fiberboard boxes with Specification 2E (§ 178.24a of this subchapter) inside polyethylene bottles made of high-density (Type III) polyethylene having minimum wall thickness of 0.015 inch with screw-cap closures, not over 1-gallon capacity each. Specification 12A fiberboard boxes may have not more than four inside polyethylene bottles which must be packed to provide a snug fit. Specification 12B fiberboard boxes may not contain more than one inside polyethylene bottle and not more than four such boxes may be overpacked in a strong outside fiberboard box under provisions of § 173.25.

§ 173.349 Carbolic acid (phenol) liquid.

(a) Carbolic acid (phenol) liquid (liquid tar acid containing over 50 percent benzo-phenol), must be packed in specification containers as follows:

(1) As prescribed in § 173.346.

(2) Specification 1A, 1C, or 1D

(§§ 178.1, 178.3, 178.4 of this subchapter). Glass carboys in boxes or kegs.

(3) Spec. 12A (§ 178.210 of this subchapter). Fiberboard boxes with inside glass bottles not over 5-pints capacity each. Not more than 6 inside glass bottles of 5-pints capacity each shall be packed in one outside container. Shipper must have established that the completed package meets test requirements prescribed by § 178.210-10 of this subchapter.

§ 173.350 Chemical ammunition.

(a) Chemical ammunition consisting of projectiles, shells, bombs, grenades and other containers filled with Poison B materials, without ignition elements, bursting charges, detonating fuzes, or other explosive components, must be packed for shipment in strong outside wooden or metal boxes. Boxes must be marked with proper shipping name and labeled as prescribed by this Part for gases, liquids, or chemicals contained therein.

(b) Chemical ammunition, when shipped as such, must not be equipped or packed with explosive or ignition elements. (See §§ 173.53 (r) and 173.59 for explosive chemical ammunition.)

§ 173.351 Hydrocyanic acid solutions.

(a) Hydrocyanic acid solutions must be packed in glass bottles not over 1 pound capacity each for solutions of not over 5 percent hydrocyanic acid and not over 5 pints capacity each for solutions of not over 2 percent strength and must be packaged as follows:

(1) Specification 15A, 15B, 15C, 16A, or 19A (§§ 178.168, 178.169, 178.170, 178.185, 178.190 of this subchapter). Wooden boxes. Completed package, with glass packaging filled with water, must be capable of withstanding six four-foot drops onto solid concrete in the following order; bottom, four sides, and top, without breakage.

§ 173.352 Sodium and potassium cyanide solutions.

(a) Sodium and potassium cyanide solutions must be packed in specification containers as follows:

(1) Spec. 5, 5A, or 5B (§§ 178.80, 178.81, of 178.82 of this subchapter). Metal barrels or drums without galvanizing inside, with openings not exceeding 2.3 inches in diameter.

(2) Specification 17E or 37B (§ 178.116, 178.132 of this subchapter). Metal drums (single-trip), with welded side seams, with openings not exceeding 2.3 inches in diameter.

(3) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 178.168, 178.169, 178.170, 178.185, or 178.190 of this subchapter). Wooden boxes with inside glass or earthenware containers not over 1 gallon capacity each, or inside metal containers not over 10 gallons capacity each, and without galvanizing.

(4) [Reserved]

(5) Specifications MC 300, MC 301, MC 302, MC 303, MC 305, or MC 306 (§ 178.341 of this chapter). Tank motor vehicles.

§ 173.353 Methyl bromide and methyl bromide mixtures.

(a) Methyl bromide, liquid (bromomethane); methyl bromide and ethylene dibromide mixture liquid; or methyl bromide and more than 2% chloropicrin mixture, liquid; must be packed in specification containers as follows:

(1) Specification 5A (§ 178.81 of this subchapter). Metal drums not exceeding 30 gallons capacity or metal drums of bilge type not exceeding 33 gallons capacity and with openings not exceeding 2.3 inches in diameter. Not authorized for mixtures containing any compressed gas.

(2) Specification 15A, 15B, 15C, 16A, 19A, or 12B (§§ 178.168, 178.169, 178.170, 178.185, 178.190, 178.205 of this subchapter). Wooden, wire-bound wooden, or fiberboard boxes, with inside metal cans containing not over 1 pound each; outage is required so the can will not become liquid full at 130° F. (55° C.). Cans must be of tinplate or lined with suitable material and must have concave or pressure ends. Cans must be able to withstand an interior pressure of 130 pounds per square inch gauge without evidence of leakage or permanent distortion. Pressure of contents must not exceed 130 psig at 130° F. (55° C.).

(3) Specification 3A225, 3AA225, 3B225, 3E1800, 4A225, 4B225, 4BA225, or 4BW225 (§§ 178.36, 178.37, 178.38, 178.42, 178.49, 178.50, 178.51, 178.61 of this subchapter). Metal cylinders. Valves and other closing devices must be protected to prevent damage in transit, by screw-

on metal caps or by packing the cylinders in strong boxes or crates. Cylinders having a wall thickness of less than 0.08 inch must be packed in boxes or crates (see § 173.25).

(4) Spec. 4D300 or 4DA500 (§ 178.53 or § 178.58 of this subchapter). Metal spheres, be packed in strong boxes or crates (see § 173.25).

(5) [Reserved]

(6) Specification 106A500X (§§ 179.-300, 179.301 of this subchapter) tanks. Outage must be sufficient to prevent tanks from becoming liquid full at 130° F. (55° C.). (See § 177.834 (m) of this subchapter for special requirements for highway shipments.)

(b) [Reserved]

(c) Outage must be sufficient to prevent cylinders or spheres from becoming entirely filled with liquid at 130° F. (55° C.) and when the vacant space (outage) is charged with a nonflammable nonliquefied compressed gas, the pressure in the cylinder or sphere at 130° F. (55° C.) must not exceed 5/4 the marked service pressure of the cylinder or sphere.

(d) Spec. 17C (§ 178.115 of this subchapter). Metal drums (single-trip) not over 5¼ gallons marked capacity each and having no opening exceeding 2.3 inches in diameter. Authorized only for mixtures of methyl bromide and ethylene dibromide, liquid containing not over 40 percent by weight of methyl bromide.

(e) Specifications MC 330 or MC 331 (§ 178.337 of this subchapter). Tank motor vehicles having a design pressure not less than 250 pounds per square inch equipped with an approved spring-relief safety valve. Outage must be sufficient to prevent tank from becoming entirely filled with liquid at 130° F. Authorized for methyl bromide-ethylene dibromide mixture only.

§ 173.353a Methyl bromide, liquid, and nonflammable, nonliquefied compressed gas mixtures.

(a) Methyl bromide, liquid and nonflammable, nonliquefied compressed gas mixtures must be packed in specification containers as noted in § 173.353(a)(2), (3), (4), (5), (6), and (c).

(b) Liquid may contain 2 percent or less by weight chloropicrin.

§ 173.354 Motor fuel antiknock compound or tetraethyl lead.

(a) Motor fuel antiknock compound (a mixture of one or more organic lead compounds such as tetraethyl lead, triethylmethyl lead, diethyldimethyl lead, ethyltrimethyl lead, and tetramethyl lead, with one or more halogen compounds such as ethylene dibromide and ethylene dichloride, hydrocarbon solvents or other equally efficient stabilizers) or tetraethyl lead must be packed in specification containers as follows:

(1) Spec. 15A (§ 178.168 of this subchapter). Wooden boxes with inside glass or earthenware containers of not over 1 pint capacity each, or metal cans, inclosed in hermetically sealed (soldered) metal cans, spec. 2A (§ 178.20 of this subchapter).

(2) Spec. 5 or 5A (§§ 178.80 or 178.81 of this subchapter). Metal barrels or drums, with openings not exceeding 2.3 inches in diameter.

(3) Cylinders as prescribed for any compressed gas, except acetylene.

(4) [Reserved]

(5) Specification MC 330 or MC 331 (§ 178.337 of this subchapter) (see Note 1). Tank motor vehicles. Authorized for motor fuel antiknock compound only.

Note 1: Spec. MC 300, MC 301, MC 302 or MC 303 (§§ 178.321, 178.323, or 178.324 of this chapter) tank motor vehicles in motor fuel antiknock compound service prior to October 1, 1955 may be continued in service.

(6) Spec. 51 (§ 178.245 of this subchapter). Portable tanks having a minimum design pressure of 100 pounds per square inch. Authorized for motor fuel antiknock compound only.

(7) Spec. 12B (§ 178.205 of this subchapter). Fiberboard boxes constructed on at least 375-pound test (Mullen or Cady) solid fiberboard with inside metal cans enclosed in hermetically sealed (soldered) metal cans, not over 5 pounds capacity each. Each inside metal container must be enclosed in a taped, double-faced corrugated liner constructed of at least 200-pound test (Mullen or Cady) fiberboard and fitted with die-cut end caps constructed of at least 200-pound test (Mullen or Cady) double-walled corrugated fiberboard. Authorized gross weight not over 90 pounds.

(b) Outage must be sufficient to prevent any container from becoming entirely filled with liquid at 130° F.

(c) Steel tanks conforming to ASME specifications (including marking) which contain solid or semisolid residual motor fuel antiknock compound (including rust, scale, or other contaminants) may be shipped by highway. All openings must be closed with gasketed blank flanges or vapor tight threaded closures. Each tank must be secured and braced to prevent movement under conditions normally incident to transportation.

§ 173.355 Phenylchlorarsine.

(a) Phenylchlorarsine must be packed in specification containers as follows:

(1) Spec. 5A (§ 178.81 of this subchapter). Metal barrels or drums, made of not less than 12 gauge steel, and limited to 30 gallons capacity, with openings not exceeding 2.3 inches in diameter. Each metal barrel or drum must be tested before each filling to 20 pounds hydrostatic test.

§ 173.356 Thiophosgene.

(a) Thiophosgene must be packed in specification containers as follows:

(1) Spec. 12B (§ 178.205 of this subchapter). Fiberboard boxes, with inside containers which must be tightly closed glass bottles not exceeding 1 pint capacity each, securely packed in absorbent incombustible cushioning material. Cushioning material must be capable of absorbing entire contents of the container.

(2) Spec. 15A or 15B (§§ 178.168 or 178.169 of this subchapter). Wooden boxes, with inside containers which must be tightly closed glass bottles not exceeding 1 quart capacity each, securely packed in absorbent incombustible cushioning material. Cushioning material must be capable of absorbing entire contents of container.

§ 173.357 Chloropicrin and chloropicrin mixtures containing no compressed gas or Poison A liquid.

(a) Chloropicrin. Chloropicrin, when offered for transportation by carriers by highway, must be packed in specification containers as follows:

(1) Spec. 15A, 15B, 15C, or 16A (§§ 178.168, 178.169, 178.170, or 178.185 of this subchapter). Wooden boxes with inside glass bottles or tubes in hermetically sealed metal cans in corrugated fiberboard cartons, spec. 2C (§ 178.22 of this subchapter). Bottles must contain

not over 1 pound of liquid each, must be filled to not over 95 percent capacity, must be tightly and securely closed, and must be cushioned in cans with at least $\frac{1}{2}$ inch of absorbent material. Cans must be made of metal at least 32 gauge United States standard. Total amount of liquid in outside box must not exceed 24 pounds.

(2) Spec. 12B (§ 178.205 of this subchapter). One-piece corrugated fiberboard boxes at least 200-pound test with inside glass bottles or tubes in hermetically sealed metal cans in individual unsealed one-piece corrugated fiberboard boxes, spec. 12B at least 200-pound test. Bottles must contain not over 1 pound of liquid each, must be filled to not over 95 percent capacity, must be tightly and securely closed, and must be cushioned in cans with at least $\frac{1}{2}$ inch of absorbent material. Cans must be made of metal at least 32 gauge United States standard. Total amount of liquid in outside box must not exceed 12 pounds.

(3) Spec. 12B (§ 178.205 of this subchapter). One-piece corrugated fiberboard boxes at least 200-pound test with not more than one inside glass bottle or tube in a hermetically sealed metal can. Bottles must contain not over 1 pound of liquid, must be filled to not over 95 percent capacity, must be tightly and securely closed, and must be cushioned in cans with at least $\frac{1}{2}$ inch of absorbent material. Cans must be made of metal at least 32 gauge United States standard.

(b) Chloropicrin and mixtures of chloropicrin containing no compressed gas or Poison A liquid. Chloropicrin and mixtures of chloropicrin containing no compressed gas or Poison A liquid, in addition to containers prescribed in paragraph (a) of this section, may be shipped in specification containers as follows:

(1) Specification 3A, 3AA, 3B, 3C, 3D, 3E, 4A, 4B, 4BA, 4BW, or 4C (§§ 178.36, 178.37, 178.38, 178.40, 178.41, 178.42, 178.49, 178.50, 178.51, 178.61, 178.52 of this subchapter). Metal cylinder. Valves or other closing devices must be protected by screw-on metal caps, or by packaging the cylinders in boxes or crates, to protect the valves from damage during transportation. A cylinder closed by means of a solid plug may have the closure protected by a metal collar. Cylinders having a wall thickness of less than 0.08 inch must be packaged in boxes or crates. Each cylinder having a

water capacity over 275 pounds must have a minimum design pressure of 225 p.s.i.g., unless the specification requires a higher minimum design pressure.

(2) Spec. 5A (§ 178.81 of this subchapter). Metal drums of not exceeding 33 gallons capacity with welded seams.

(3) Spec. 17C or 17E (§§ 178.115 and 178.116 of this subchapter). Metal drums (single-trip) with openings not exceeding 2.3 inches in diameter. Capacity not to exceed 30 gallons. Authorized only for chlorpicrin mixtures containing not to exceed 15 percent chlorpicrin by weight or 15 percent by volume chlorpicrin, 85 percent by volume dichloropropene technical, and only authorized for such mixtures not classed as flammable under these regulations.

(4) Specification 106A500X (§§ 179.300, 179.301 of this subchapter) tanks. Valves must be protected by metal caps. Tanks must not be equipped with safety devices of any type. Outage must be sufficient to prevent tanks from becoming liquid full at 130° F. (55° C.). (See § 177.834(m) of this subchapter for special requirements for highway shipments.)

(c) Chloropicrin and mixtures of chloropicrin containing no compressed gas or Poison A liquid, must be packaged as follows:

(1) Spec. 15A, 15B, 15C, or 16A (§§ 178.168, 178.169, 178.170, or 178.185 of this subchapter). Wooden boxes with inside glass bottles or tubes in hermetically sealed metal cans in corrugated fiberboard cartons, spec. 2C (§ 178.22 of this subchapter). Bottles must contain not over 1 pound of liquid each, must be filled to not over 95 percent capacity, must be tightly and securely closed, and must be cushioned in cans with at least ½ inch of absorbent material. Cans must be made of metal at least 32 gauge United States standard. Total amount of liquid in outside box must not exceed 24 pounds.

(2) Spec. 15A (§ 178.168 of this subchapter). Wooden boxes, metal strapped, with chlorpicrin absorbed in an efficient absorbing material packed in hermetically sealed metal cans not exceeding 1 quart capacity each.

(3) Spec. 12B (§ 178.205 of this subchapter). One-piece corrugated fiberboard boxes at least 200-pound test with inside glass bottles or tubes in hermetically sealed metal cans in individual unsealed one-piece corrugated fiberboard boxes. Spec. 12B at least 200-pound test.

Bottles must contain not over 1 pound of liquid each, must be filled to not over 95 percent capacity, must be tightly and securely closed, and must be cushioned in cans with at least ½ inch of absorbent material. Cans must be made of metal at least 32 gauge United States standard. Total amount of liquid in outside box must not exceed 12 pounds.

(4) Spec. 12B (§ 178.205 of this subchapter). One-piece corrugated fiberboard boxes at least 200-pound test with not more than one inside glass bottle or tube in a hermetically sealed metal can.

Bottles must contain not over 1 pound of liquid, must be filled to not over 95 percent capacity, must be tightly and securely closed, and must be cushioned in cans with at least ½ inch of absorbent material. Cans must be made of metal at least 32 gauge United States standard.

§ 173.358 Hexaethyl tetraphosphate, methyl parathion, organic phosphate compound, organic phosphorous compound, parathion, tetraethyl dithio pyrophosphate, and tetraethyl pyrophosphate, liquid.

(a) Hexaethyl tetraphosphate, methyl parathion, organic phosphate compound, organic phosphorous compound, parathion, tetraethyl dithio pyrophosphate, and tetraethyl pyrophosphate, liquid must be packed in specification containers as follows:

(1) Spec. 5, 5A, or 5B (§§ 178.80, 178.81, 178.82 of this subchapter). Metal barrels or drums, with openings not exceeding 2.3 inches in diameter.

(2) Spec. 17C or 17E (§§ 178.115, 178.116 of this subchapter). Metal drums (single-trip), with openings not exceeding 2.3 inches in diameter. Spec. 17E drums authorized for not over 5 gallons capacity each.

(3) Spec. 15A or 15B (§§ 178.168, 178.169 of this subchapter). Wooden boxes, with metal inside containers of not over 5 gallons capacity each.

(4) Spec. 12B (§ 178.205 of this subchapter). Fiberboard boxes, with inside glass bottles not over 1 gallon capacity each, securely cushioned in liquid-tight metal cans.

(5) Specification 21C (§ 178.224 of this subchapter). Fiber drums, with inside glass or metal containers not over 1-gallon capacity each.

(6) Spec. 37A (§ 178.131 of this subchapter). Metal drums (single-trip), with inside glass containers not over 1

gallon capacity each.

(7) Cylinders as prescribed for any compressed gas, except acetylene, are also authorized.

(8) Spec. 12B (§ 178.205 of this subchapter). Fiberboard boxes with not more than one inside glass container of not over 1 gallon capacity, securely cushioned. Completed package, with glass container filled with water, when closed for shipment, must be capable of withstanding six four-foot drops onto solid concrete in the order bottom, four sides and top without breakage.

(9) Spec. 12B (§ 178.205 of this subchapter). Fiberboard boxes with not more than one inside container of polyethylene, or other nonfragile plastic material, and closed by a screw cap of similar material, not over 16 ounces, surrounded by absorbent cushioning and packed in a one gallon securely closed metal can which shall be surrounded with absorbent cushioning material within the outside fiberboard box.

(10) Spec. 42B (§ 178.107 of this subchapter). Aluminum drums.

(11) [Reserved]

(12) Specification 6D (§ 178.102 of this subchapter). Cylindrical steel overpack with an inside specification 2S (§ 178.35 of this subchapter) polyethylene container. Each full removable head overpack over 5 gallons capacity must be closed by means of a 12-gage steel bolted ring closure with drop forged lugs, one of which is appropriately threaded. For an overpack not over 30 gallons capacity, the threaded lug must have at least a $\frac{3}{8}$ -inch bolt and locking nut, and for an overpack over 30 gallons capacity the bolt and locking nut must be at least $\frac{5}{8}$ -inch. Authorized only for materials that will not react with polyethylene and result in container failure.

(13) Specification 51 (§ 178.245 of this subchapter). Portable tanks. Tanks must have no bottom opening except one 3-inch maximum plugged opening for maintenance purposes is authorized. Contents of the tank must be under no gas pressure except its own vapor pressure and the commodity must be loaded into, and unloaded from, the tank while the tank is mounted on the vehicle chassis. Authorized for parathion, methyl parathion, and organic phosphate compound only and by private motor carrier only.

§ 173.359 Hexaethyl tetraphosphate mixtures; methyl parathion mixtures; organic phosphorus compound mixtures; organic phosphate compound mixtures; parathion mixtures; tetraethyl dithio pyrophosphate mixtures; and tetraethyl pyrophosphate mixtures, liquid (includes solutions, emulsions, or emulsifiable liquids).

(a) Hexaethyl tetraphosphate mixtures, methyl parathion mixtures, organic phosphate compound mixtures, parathion mixtures, tetraethyl dithio pyrophosphate mixtures, and tetraethyl pyrophosphate mixtures (solutions, emulsions, or emulsifiable liquids) containing not more than 50 percent hexaethyl tetraphosphate, methyl parathion, organic phosphate compound mixtures, n.o.s., parathion, tetraethyl dithio pyrophosphate, or tetraethyl pyrophosphate by weight, must be packed in specification containers as follows:

(1) Spec. 5, 5A, or 5B (§§ 178.80, 178.81, or 178.82 of this subchapter). Metal barrels or drums, with openings not exceeding 2.3 inches in diameter.

(2) Spec. 17C (§ 178.115 of this subchapter). Metal drums (single-trip), with openings not exceeding 2.3 inches in diameter.

(3) Spec. 17E or 37B (§ 178.116 or § 178.132 of this subchapter). Metal drums (single-trip) with openings not exceeding 2.3 inches in diameter. Capacity not to exceed 10 gallons for spec. 17E drums. Spec. 37B drums must be constructed of at least 24-gauge metal with welded side seams, of capacity not over $5\frac{1}{2}$ gallons, and must be tested as prescribed by § 178.116-12 and 178.116-13 of this subchapter. Authorized only for mixtures not classed as flammable under these regulations.

(4) Spec. 15A, 15B, 15C, or 15E (§§ 178.168, 178.169, 178.170, or 178.172 of this subchapter). Wooden boxes, with metal inside containers not over 10 gallons capacity each.

(5) Spec. 12B (§ 178.205 of this subchapter). Fiberboard boxes, with inside glass bottles not over 1 gallon capacity each, securely cushioned in liquid-tight metal cans.

(6) Specification 21C (§ 178.224 of this subchapter). Fiber drums, with inside glass or metal containers not over 1-gallon capacity each.

(7) Spec. 37A (§ 178.131 of this subchapter). Metal drums (single-trip),

with inside glass containers not over 1 gallon capacity each.

(8) Spec. 12B (§ 178.205 of this subchapter). Fiberboard boxes as authorized by § 178.205-19(a) of this subchapter.

(9) Spec. 12B (§ 178.205 of this subchapter). Fiberboard boxes with not more than one inside glass container of not over 1 gallon capacity, securely cushioned. Completed package, with glass container filled with water, when closed for shipment, must be capable of withstanding six four-foot drops onto solid concrete in the order bottom, four sides and top without breakage.

(10) Spec. 42B (§ 178.107 of this subchapter). Aluminum drums.

(11) Spec. 12B (§ 178.205 of this subchapter). Fiberboard boxes with inside high-density polyethylene bottles not over 1-gallon capacity each. Polyethylene bottles must have a minimum wall thickness of 0.015 inch and be equipped with screw-cap closures additionally taped for securement. Each polyethylene bottle shall be packed in an inside fiberboard box. Not more than four inside fiberboard boxes with inside polyethylene bottles shall be packed in one outside shipping container. Polyethylene used in construction of inside polyethylene bottles must be of a type compatible with the lading and shall prevent permeation of contents to a degree that would cause a hazardous condition in transportation and handling.

(12) Spec. 12A (§ 178.210 of this subchapter). Fiberboard boxes with inside securely closed metal containers not over 1-gallon capacity each. Fiberboard boxes shall be constructed of not less than 500-pound test (Mullen or Cady) double-wall corrugated fiberboard. Not more than six 1-gallon metal containers shall be packed in one outside container. Authorized gross weight not over 65 pounds.

(13) [Reserved]

(14) Specification 6D (§ 178.102 of this subchapter). Cylindrical steel overpack with an inside specification 2S (§ 178.35 of this subchapter) polyethylene container. Each full removable head overpack over 5 gallons capacity must be closed by means of a 12-gage steel bolted ring closure with drop forged lugs, one of which is appropriately threaded. For an overpack not over 30 gallons capacity, the threaded lug must have at least a

$\frac{3}{8}$ -inch bolt and locking nut, and for an overpack over 30 gallons capacity the bolt and locking nut must be at least $\frac{1}{2}$ -inch. Authorized only for materials that will not react with polyethylene and result in container failure.

(15) Specification 51 (§ 178.245 of this subchapter). Portable tanks. Tanks must have no bottom opening except one 3-inch maximum plugged opening for maintenance purposes is authorized. Contents of the tank must be under no gas pressure except its own vapor pressure and the commodity must be loaded into, and unloaded from, the tank while the tank is mounted on the vehicle chassis. Authorized for methyl parathion mixtures, organic phosphate compound mixtures, and parathion mixtures only and by private motor carrier only.

(b) **Hexaethyl tetraphosphate mixtures, methyl parathion mixtures, organic phosphate compound mixtures, parathion mixtures, tetraethyl dithio pyrophosphate mixtures, and tetraethyl pyrophosphate mixtures** (solutions, emulsions, or emulsifiable liquids) containing more than 50 percent hexaethyl tetraphosphate, methyl parathion, organic phosphate compound mixtures, parathion, tetraethyl dithio pyrophosphate, or tetraethyl pyrophosphate by weight, must be packed in specification containers as follows:

(1) Spec. 5, 5A, or 5B (§§ 178.80, 178.81, or 178.82 of this subchapter). Metal barrels or drums, with openings not exceeding 2.3 inches in diameter.

(2) Spec. 17C, 17E, or 37B (§ 178.115, § 178.116, or § 178.132 of this subchapter). Metal drums single-trip) with openings not exceeding 2.7 inches in diameter. Spec. 17E drums authorized for not over 5 gallons capacity each. Spec. 37B drums must be constructed of at least 24-gauge metal with welded side seam, of not over 5½ gallons capacity, and must be tested as prescribed by §§ 178.116-12 and 178.116-13 of this subchapter.

(3) Spec. 15A or 15B (§§ 178.168 or 178.169 of this subchapter). Wooden boxes, with metal inside containers not over 5 gallons capacity each.

(4) Spec. 12B (§ 178.205 of this subchapter). Fiberboard boxes, with inside glass bottles not over 1 gallon capacity each, securely cushioned in liquid-tight metal cans.

(5) Specification 21C (§ 178.224 of this subchapter). Fiber drums, with inside glass or metal containers not over 1-gallon capacity each.

(6) Spec. 37A (§ 178.131 of this subchapter). Metal drums (single-trip), with inside glass containers not over 1 gallon capacity each.

(7) Spec. 12B (§ 178.205 of this subchapter). Fiberboard boxes with not more than one inside glass container of not over 1 gallon capacity securely cushioned. Completed package, with glass container filled with water, when closed for shipment, must be capable of withstanding six four-foot drops onto solid concrete in the order bottom, four sides, and top without breakage.

(8) Spec. 42B (§ 178.107 of this subchapter). Aluminum drums.

(9) Spec. 12B (§ 178.205 of this subchapter). Fiberboard boxes with not more than six inside high-density polyethylene bottles having screw-cap closures, not over 1-quart capacity each. Fiberboard boxes must have full-height corrugated fiberboard liner, top and bottom pads, and bottles must be separated by corrugated fiberboard partitions. Plastic used in construction of bottles must be of a type compatible with the lading.

(10) Specification 6D (§ 178.102 of this subchapter). Cylindrical steel overpack with an inside specification 2S (§ 178.35 of this subchapter) polyethylene container. Each full removable head overpack over 5 gallons capacity must be closed by means of a 12-gage steel bolted ring closure with drop forged lugs, one of which is appropriately threaded. For an overpack not over 30 gallons capacity, the threaded lug must have at least a $\frac{3}{8}$ -inch bolt and locking nut, and for an overpack over 30 gallons capacity the bolt and locking nut must be at least $\frac{3}{8}$ -inch. Authorized only for materials that will not react with polyethylene and result in container failure.

(11) Specification 12B30 (§ 178.205 of this subchapter). Fiberboard boxes of not less than 275-pound test double wall corrugated with a 5-mil one piece polyethylene bag form-fitted to the inner wall. Authorized only for pressure sealed polyethylene capsules containing not over 3 milliliters each.

(c) Hexaethyl tetraphosphate mixtures, methyl parathion mixtures, organic phosphorus compound mixtures, n.o.s., organic phosphate compound mixtures, n.o.s., parathion mixtures, tetra-

ethyl dithio pyrophosphate mixtures, and tetraethyl pyrophosphate mixtures (solutions, emulsions, or emulsifiable liquids) containing not more than 25 percent hexaethyl tetraphosphate, methyl parathion, organic phosphate compound mixtures, n.o.s., parathion, tetraethyl dithio pyrophosphate, or tetraethyl pyrophosphate by weight, in inside metal containers not over 8 fluid ounces capacity each, packed in strong outside containers together with sufficient absorbent material to completely absorb the liquid in the event of leakage, are excepted from specification packaging requirements of this Part.

§ 173.360 Perchloro-methyl-mercaptan.

(a) Perchloro-methyl-mercaptan in any quantity must not be packed with any other article. When offered for transportation must be packed in specification containers as follows:

(1) [Reserved]

(2) Spec. 15A, 15B, 15C, or 16A (§§ 178.168, 178.169, 178.170, or 178.185 of this subchapter). Wooden boxes, with inside containers which must be glass bottles not over 2 quarts capacity each, individually enclosed in tightly closed metal cans and cushioned therein with incombustible material. Net weight not over 100 pounds in one outside container.

(3) Spec. 5H (§ 178.87 of this subchapter). Lead-lined metal barrels or drums not over 33 gallons each.

(4) Spec. 5K or 5M (§ 178.88 or § 178.90 of this subchapter). Nickel or monel barrels or drums.

(5) Specification 51 (§ 178.245 of this subchapter). Portable tanks, monel-clad. Tanks with bottom discharge outlets are prohibited.

§ 173.361 Aldrin mixtures, liquid, with more than 60 percent aldrin.

(a) Aldrin mixtures, liquid, with more than 60 percent aldrin must be shipped in specification containers as follows:

(1) As prescribed in § 173.346.

(2) Spec. 6A, 6B, or 6C (§§ 178.97, 178.98, or § 178.99 of this subchapter). Metal barrels or drums. Authorized only for viscous mixtures or those which may become partially solid.

(3) Spec. 17C or 17H (§ 178.115 or § 178.118 of this subchapter). Metal drums (single-trip). Drums with opening exceeding 2.3 inches in diameter authorized only for viscous mixtures or those which may become partially solid.

§ 173.362 4-Chloro-o-toluidine hydrochloride.

(a) 4-Chloro-o-toluidine hydrochloride must be shipped in specification containers as follows:

(1) Spec. 12B (§ 178.205 of this subchapter). Fiberboard boxes with glass polyethylene, or equally efficient inside containers not over 1 quart capacity each, securely packed in a tightly closed metal container.

(2) Spec. 15A or 15B (§§ 178.168 or 178.169 of this subchapter). Wooden boxes with glass, polyethylene, or equally efficient inside containers not over 1 quart capacity each. Glass containers must be securely packed in tightly closed metal containers.

(3) Spec. 17C or 17H (§§ 178.115 or 178.118 of this subchapter). Metal drums (single-trip).

(4) Spec. 6A, 6B, or 6C (§§ 178.97, 178.98, or 178.99 of this subchapter). Metal barrels or drums.

§ 173.362a Dinitrophenol solutions.

(a) Dinitrophenol solutions must be packed in specification containers as follows:

(1) In containers prescribed in § 173.346.

(2) Spec. 12B (§ 178.205 of this subchapter). Fiberboard box with glass, earthenware, or metal inside containers not over 1 gallon capacity each; not to contain more than 4 inside glass or earthenware containers if their capacity is greater than 5 pints each.

§ 173.363 General packaging requirements for Poison B solids.

(a) Closing and cushioning. All containers must be tightly and securely closed. Inside containers must be cushioned as prescribed, or in any case when necessary to prevent breakage or leakage.

(b) Testing inside containers. All inside containers, except those made of glass, must be able to pass a test by dropping, after filling, from a height of 4 feet to solid concrete without rupture or sifting of contents, except that for bags with contents weighing 25 pounds, a drop test of 2 feet is required.

§ 173.364 Limited quantities of Poison B solids.

(a) Unless otherwise excluded by paragraph (3) of this section, limited quantities of Poison B solids for which exceptions are permitted as noted by reference to this section in § 172.101 of this subchapter are not subject to Part 172 or Part 177 of this subchapter, and are excepted from specification packaging requirements of this Part if in tightly closed, inside packaging securely cushioned when necessary to prevent breakage as follows:

(1) In inside glass, earthenware, or composition bottles or jars, or metal containers, or lock-corner sliding-lid wooden boxes, of not over 5 pounds capacity each; or chipboard, pasteboard, or fiber cartons, cans, boxes, or tightly closed strong plastic bags, jars or bottles compatible with product of not over 1 pound capacity each, packed in outside wooden or fiberboard boxes, or wooden barrels or kegs. Net weight of contents of outside container not over 100 pounds.

(2) In inside plastic bottles or jars, chipboard, pasteboard or fiber cartons, cans, or boxes, of not over 5 pounds capacity each, packed in outside fiberboard or wooden boxes. Not more than 6 of these cartons shall be packed in any outside container.

(3) The following materials are excluded from this exception: Cyanides (other than as specified in 173.370 (b) and (d)), hexaethyl tetraphosphate mixtures, methyl parathion mixtures, organic phosphorus compound mixtures, and organic phosphate mixtures.

(b) Special exceptions for shipment of certain drugs and medicines in the ORM-D class are prescribed in Subpart N of this part.

§ 173.365 Poison B solids not specifically provided for.

(a) Poison B solids, as defined in § 173.343, other than those for which special requirements are prescribed, must be packaged as follows:

(1) Spec. 5, 5A, 5B, 6A, 6B, or 6C (§§ 178.80, 178.81, 178.82, 178.97, 178.98, or 178.99 of this subchapter). Metal barrels or drums.

(2) Spec. 17E, 17H, 37A, or 37B (§§ 178.116, 178.118, 178.131, or § 178.132 of this subchapter). Metal drums (single-trip). Gross weight not over 375 pounds, except for material fused solid in the drum a gross weight of 880 pounds and not over 550 pounds gross weight for

waste material containing arsenic trioxide is authorized in drums constructed of at least 18 gauge steel regardless of gross weight marking embossed in the container.

(3) [Reserved]

(4) [Reserved]

(5) [Reserved]

(6) Spec. 12B or 12C (§§ 178.205 or 178.206 of this subchapter). Fiberboard boxes, with inside containers which must be metal cans not over 25 pounds capacity each; glass bottles not over 1 gallon capacity each; fiber cans or boxes, spec. 2G (§ 178.26 of this subchapter); sliding-top wooden boxes, lined to prevent sifting, not over 25 pounds capacity each; or paper bags, spec. 2D (§ 178.23 of this subchapter). Packages containing glass or earthenware containers must not weigh over 65 pounds gross nor contain more than 4 inside containers of over 5 pints capacity each. Outside containers must be not over 5,000 cubic inches capacity nor contain over 50 pounds net weight each, except as provided in § 178.205-23 of this subchapter.

Test: The completed package prepared as for shipping must be capable of standing a drop of 4 feet to solid concrete without breakage of the container or any sifting of contents.

(7) Spec. 12B (§ 178.205 of this subchapter). Fiberboard boxes with securely closed inside fiberboard or chipboard boxes not over 6 pounds net weight each. Interior containers must be at least .028 inch thick for those not over 2½ pounds net weight each and at least .034 inch thick for others. Outside packages must contain not over 36 pounds net weight of material each.

Test: The individual interior containers as well as the completed package prepared as for shipping must be capable of standing a drop of 4 feet to solid concrete without breakage of the container or any sifting of contents.

(8) Spec. 15A (§ 178.168 of this subchapter). Wooden boxes, with inside containers which must be securely closed paper bags, placed within a waterproof duplex bag, spec. 2J (§ 178.28 of this subchapter). Net weight of material in one outside box, not over 100 pounds.

(9) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 178.168, 178.169, 178.170, 178.185, or 178.190 of this subchapter). Wooden boxes, with inside containers which must

be metal cans not over 25 pounds capacity each; glass or earthenware containers not over 1 gallon capacity each; except that inside containers of not over 5 gallons each and containing not over 25 pounds net weight are authorized when only one inside container is packed in each outside container. Fiber cans or boxes, spec. 2G (§ 178.26 of this subchapter), or sliding-top wooden boxes, lined to prevent sifting, not over 25 pounds capacity each. Net weight of material in outside container, not over 100 pounds each.

(10) Spec. 18B (§ 178.193 of this subchapter). Wooden kits lined as prescribed by spec. 2K (§ 178.29 of this subchapter). Net weight not over 30 pounds each.

(11) [Reserved]

(12) Spec. 22A (§ 178.196 of this subchapter). Plywood drums. Net weight not over 115 pounds each.

(13) [Reserved]

(14) Spec. 21C (§ 178.224 of this subchapter). Fiber drums. Authorized net weight not over 225 pounds.

(15) Specification 12B (§ 178.205 of this subchapter). Fiberboard boxes constructed of at least 275-pound test double-faced fiberboard and provided with a perimeter liner and bottom pad of at least 200-pound test fiberboard. Boxes constructed of at least 350-pound fiberboard having top and bottom pads need not have a perimeter liner. Product must be contained within a tightly closed polyethylene or other equally efficient plastic bag constructed of material having a minimum thickness of 0.004-inch. Not more than 25 pounds net weight or product may be packed in one outside box.

(16) Spec. 12A (§ 178.210 of this subchapter). Fiberboard boxes with inside glass bottles not over 5 pounds capacity each. Not more than 4 inside glass bottles of 5 pounds capacity each shall be packed in one outside container. Shipper must have established that the completed package meets test requirements prescribed by § 178.210-10 of this subchapter.

(17) Spec. 37P (§ 178.133 of this subchapter). Steel drums with polyethylene liner (nonreusable container), not over 15-gallons capacity.

§ 173.366 Arsenic (arsenic trioxide) or arsenic acid (solid).

(a) Arsenic (arsenic trioxide) or arsenic acid (solid) must be packed in

specification containers as follows:

- (1) As prescribed in § 173.365.
 - (2) [Reserved]
 - (3) In addition to specification containers prescribed in this section, arsenic (arsenic trioxide) or arsenic acid (solid) may be shipped when packed in portable, collapsible, rubber containers, not over 70 cubic feet capacity, of a type approved by the Bureau of Explosives. Authorized for truckload shipments only.
 - (b) Import shipments of arsenic (arsenic trioxide) may also be shipped when packed as follows:
 - (1) Inclosed in strong waterproofed cloth containers, securely sewn and closed so as to provide a sift-proof package, and then packed in strong, tight, metal-strapped wooden boxes constructed of material not less than three-fourths inch thick throughout.
 - (2) In strong and tight metal drums inclosed in a strong outside wooden barrel.
 - (3) In tight metal drums of not over 25-gallon capacity and a maximum gross weight of 460 pounds. Drums must be constructed of at least 22-gauge steel.
- § 173.367 Arsenical compounds, n.o.s.; arsenate of lead; calcium arsenate; Paris green; and arsenical mixtures.**
- (a) Arsenical compounds n.o.s., arsenate of lead, calcium arsenate, Paris green, and arsenical mixtures must be packed in specification containers as follows:
 - (1) As prescribed in § 173.365.
 - (2) Specification 36A or 36B (§§ 178.230, 178.233 of this subchapter). Triplex bags. Authorized only for arsenical insecticides and fungicides containing 10 percent or less of arsenic trioxide.
 - (3) Specification 44B (§ 178.236 of this subchapter). Multiwall paper bags with inside paper bags, specification 2D (§ 178.23 of this subchapter). Net weight not over 50 pounds each.
 - (4) Specification 44C (§ 178.237 of this subchapter). Multiwall paper bags. For truckload shipments only. Net weight not over 50 pounds each.
 - (5) Specification 44D (§ 178.238 of this subchapter). Multiwall paper bags. Where extensible Kraft is used the minimum total basis weight must be 260 pounds and the outer wall may be no less than 60 pounds basis weight. Net weight not over 50 pounds each.

(6) Specification 44E (§ 178.239 of this subchapter). Multi-wall paper bags constructed with minimum total basis weight of 160 pounds. For truckload shipment only by highway transportation; loaded by the consignor and unloaded by the consignee or his duly authorized agent. Net weight not over 50 pounds each. Where extensible Kraft is used, the minimum total basis weight for 40-pound net weight bags must be 190 pounds and for 20-pound net weight bags it must be 150 pounds.

(b) Arsenical compounds n.o.s. containing not more than 6 percent arsenic of which not more than 0.5 percent is water soluble must be packed in specification containers as follows:

(1) As prescribed in paragraph (a) (1), (2), or (3) of this section.

(2) Specification 44B (§ 178.236 of this subchapter). Paper bags with two added inside thicknesses of No. 1 Kraft paper one sheet having a Mullen test of 50 and the other sheet having a Mullen test of 40. Net weight not over 50 pounds each.

§ 173.368 Arsenical dust, arsenical flue dust, and other poisonous non-combustible by-product dusts; also arsenic trioxide, calcium arsenate, and sodium arsenate.

(a) Arsenic dust, arsenical flue dust, and other poisonous noncombustible by-product dusts from metal recovery operations not subject to dangerous spontaneous heating, and arsenic trioxide, calcium arsenate, or sodium arsenate may, in addition to packagings prescribed in § 173.367, be shipped in bulk in the following kinds of transport vehicles, if those transport vehicles are assigned exclusively to this type of service:

- (1) (See § 177.841(a) - (e)).
- (2) Dump-type motor vehicles having bodies with waterproof and dust-proof covers well secured in place.
- (b) Transport vehicles assigned exclusively to this service must be marked "ARSENICAL SERVICE ONLY," in addition to other required markings, and are not subject to § 177.841 of this subchapter while in that service.

§ 173.369 Carbolic acid (phenol), not liquid.

(a) Carbolic acid (phenol), not liquid must be packed in specification containers as follows:

(1) Spec 5, 5A, 5B, 5C, 6A, 6B, or 6C (§§ 178.80, 178.91, 178.92, 178.93, 178.97,

178.98, or 178.99 of this subchapter). Metal barrels or drums.

(2) [Reserved]

(3) [Reserved]

(4) Spec. 12B (§ 178.205 of this subchapter). Fiberboard boxes with inside containers which must be metal cans not over 25 pounds capacity each.

(5) Spec. 12B (§ 178.205 of this subchapter). Fiberboard boxes with glass or earthenware inside containers not over 1 quart capacity each, or with metal inside containers not over 1 gallon capacity each. Packages containing glass or earthenware containers must not weigh over 65 pounds gross; packages containing metal cans not over 64 pounds gross as provided in § 178.205-23 of this subchapter, 65 pounds for others.

(6) Spec. 12D (§ 178.207 of this subchapter). Fiberboard boxes with inside containers which must be: Glass or earthenware not over 1 gallon or 5 pounds capacity each; authorized for not more than 75 pounds gross weight; not to contain more than 4 such inside containers if their capacity is greater than 5 pints each.

(7) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 178.168, 178.169, 178.170, 178.185, or 178.190 of this subchapter). Wooden boxes with glass or earthenware inside containers not over 1 gallon or 5 pounds capacity each, except that inside containers up to 3 gallons or 15 pounds capacity each are authorized when only 1 is packed in each outside container; or with metal inside containers not over 10 gallons capacity each.

(8) Spec. 15A, 15B, or 15C (§§ 178.168, 178.169, or 178.170 of this subchapter). Wooden boxes with metal inside containers. Spec. 2F (§ 178.25 of this subchapter) not over 250 pounds total capacity each.

(9) Spec. 17E or 17H (§ 178.116 or § 178.118 of this subchapter). Metal drums (single-trip).

(10) [Reserved]

(11) Specification 37A or 37B (§§ 178.131, 178.132 of this subchapter). Metal drums (single-trip).

(12) Spec. 42B or 42C (§§ 178.107 or 178.108 of this subchapter). Aluminum drums.

(13) [Reserved]

(14) Specifications MC 300, MC 301, MC 302, MC 303, MC 305, MC 306, MC 310, FC 311, or MC 312 (§§ 178.341, 178.343 of this subchapter). Tank motor

vehicles.

(1) No cargo tank or compartment thereof shall be completely filled; sufficient space shall be left vacant in every case to prevent leakage from or distortion of any such cargo tank by expansion of the contents due to rise in temperature in transit, and such free space (outage) shall be sufficient in every case so that such cargo tank shall not become entirely filled with the commodity at 130° F.

(15) Spec. 12A (§ 178.210 of this subchapter). Fiberboard boxes with inside glass, polyethylene, or other nonfragile plastic bottles not over 5 pounds capacity each. Not more than 4 inside glass bottles of 5 pounds capacity each shall be packed in one outside container. Shipper must have established that the completed package meets test requirements prescribed by § 178.210-10 of this subchapter.

(16) Spec. 21C (§ 178.224 of this subchapter). Fiber drums with not more than one inside metal container, spec. 2A (§ 178.20 of this subchapter), having maximum net weight of 50 pounds.

(b) Carboic acid (phenol), not liquid, in tightly closed inside packagings, securely cushioned when necessary to prevent breakage and packaged as follows, is excepted from the specification packaging requirements of this Part.

(1) In inside glass, earthenware, polyethylene or other nonfragile plastic bottles or jars not over 1 pound capacity each, or metal containers not over 5 pounds capacity each, packed in outside wooden boxes, barrels or kegs, or fiberboard boxes. Net weight of contents in fiberboard boxes shall not exceed 65 pounds; and not more than 100 pounds in wooden boxes, barrels or kegs.

§ 173.370 Cyanides and cyanide mixtures, dry.

(a) Cyanides and cyanide mixtures, dry, except cyanide of calcium and mixtures thereof, unless otherwise provided for in this section, if containing the cyanide equivalent of 10 percent or more of potassium cyanide, must be packaged as follows:

(1) Spec. 15A, 15B, or 15C (§§ 178.168, 178.169, or 178.170 of this subchapter). Wooden boxes with metal inside containers, spec. 2F (§ 178.25 of this subchapter), not over 25 pounds capacity each; or hermetically sealed (soldered) metal lining, spec. 2F, or in glass bottles not over 5 pounds capacity each.

(2) [Reserved]

(3) **Spec. 12B or 12C (§§ 178.205 or 178.206 of this subchapter).** Fiberboard boxes with metal inside containers, spec. 2F (§ 178.25 of this subchapter) not over 25 pounds capacity each.

(4) **Spec. 5, 5A, 5B, 6A, 6B, or 6C (§§ 178.80, 178.81, 178.82, 178.97, 178.98, or 178.99 of this subchapter).** Metal barrels or drums.

(5) **Spec. 37A or 37B (§ 178.131 or § 178.132 of this subchapter).** metal drums (single-trip containers).

(6) [Reserved]

(7) **Spec. 17H (§ 178.118 of this subchapter).** metal drums. Gross weight not over 450 pounds.

(8) **Specification 45B § 178.240 of this subchapter).** Bags, cloth, and paper, lined. Authorized only for sodium cyanides of globular or pellet form, diameter not less than $\frac{3}{4}$ -inch. Net weight not over 100 pounds.

(9) **Bulk in watertight metal-bodied covered motor vehicles.**

(10) [Reserved]

(11) **Spec. 21C (§ 178.224 of this subchapter).** Fiber drums. Authorized net weight not over 225 pounds.

(12) **Specification 12B (§ 178.205 of this subchapter).** Fiberboard boxes constructed of at least 275-pound test double-faced fiberboard and provided with a perimeter liner and bottom pad of at least 200-pound test fiberboard. Boxes constructed of at least 350-pound fiberboard having top and bottom pads may not require perimeter liner. Products must be contained within a tightly closed polyethylene or other equally efficient plastic container constructed of material having minimum thickness of 0.004-inch. Not more than 25 pounds net weight of product may be packed in one outside box.

(13) **Bulk in strong, water-tight, metal portable containers of not over 70 cubic feet capacity each, approved by the Bureau of Explosives.**

(b) *Exceptions for cyanides, and cyanide mixtures, except cyanide of calcium and mixtures thereof.* Cyanides and cyanide mixtures, except cyanide of calcium and mixtures thereof, when described and packaged as follows, are excepted from the specification packaging requirements of this Part:

(1) Cyanides, or cyanide mixtures, in tightly closed glass, earthenware, metal, or polyethylene inside containers, not over 1 pound each, securely cushioned and packed in outside wooden or fiberboard boxes, or in wooden barrels. Net weight of cyanides or cyanide mixtures in any outside container, not over 25 pounds.

(2) Cyanide mixtures in tightly closed glass, earthenware, or metal inside containers, securely cushioned and packed in outside wooden or fiberboard boxes, or in wooden barrels. Net weight of cyanide mixtures in any outside container not over 5 pounds.

(3) Cyanides of copper, zinc, lead, and silver are excepted from all packaging requirements except §§ 173.24 and 173.363.

(c) *Cyanide of calcium and mixture thereof.* Cyanide of calcium and mixtures thereof must be packed in specification containers as follows:

(1) As prescribed in paragraph (a) (3), (4), (9), or (11) of this section.

(2) **Spec. 15A, 15B, or 15C (§§ 178.168, 178.169, or 178.170 of this subchapter).** Wooden boxes with metal inside containers, spec. 2F, not over 25 pounds capacity each; or hermetically sealed (soldered) metal lining, spec. 2F (§§ 178.25 of this subchapter).

(3) **Spec. 37A or 37B (§ 178.131 or § 178.132 of this subchapter).** metal drums (single-trip containers); welded side seams required for Spec. 37B drums and all seams and closures must be watertight and hermetically sealed.

(d) *Exceptions for cyanide of calcium and mixtures thereof.* Cyanide of calcium and mixtures thereof, when described and packaged as follows, are excepted from the specification packaging requirements of this Part.

(1) Cyanide of calcium and mixtures thereof in tightly closed metal inside containers having not over 1 pound net weight each, or metal cans having not over 5 pounds net weight each. Not more than 25-1 pound containers or more than 1-5-pound container securely cushioned may be packed in the outside container which must be wooden or fiberboard boxes, or wooden barrels.

§ 173.371 Dinitrobenzol (dinitrobenzene).

(a) Dinitrobenzol must be packaged as follows:

(1) As prescribed in § 173.346 or 173.365 according to its physical form at 130° F. (55° C.).

§ 173.372 Mercury bichloride (mercuric chloride).

(a) Mercury bichloride (mercuric chloride) must be packed in specification containers as follows:

(1) As prescribed in § 173.365.

(2) Spec. 15A (§ 178.168 of this subchapter). Wooden boxes with inside containers consisting of strong paper bags in tightly closed inside wooden boxes.

§ 173.373 Ortho-nitroaniline and para-nitroaniline.

(a) Ortho-nitroaniline and para-nitroaniline must be packed in specification containers as follows:

(1) As prescribed in § 173.365.

(2) [Reserved]

(3) Spec. 21C (§ 178.224 of this subchapter). Fiber drums. Authorized net weight not over 400 pounds.

(4) In addition to specification containers prescribed in this section, paranitroaniline may be shipped by highway in bulk in strong, water-tight, metal bodied covered hopper motor vehicles.

(5) Specification 56 (§ 178.252 of this subchapter). Metal portable tank. Authorized for para-nitroaniline only.

§ 173.374 Nitrochlorbenzene, meta or para.

(a) Nitrochlorbenzene, meta or para, must be packed in specification containers as follows:

(1) As prescribed in § 173.365.

(2) Spec. 21C (§ 178.224 of this subchapter). Fiber drums, authorized only for nitrochlorbenzene, para, flaked. Authorized net weight not over 400 pounds.

(3) Spec. 17E (§ 178.116 of this subchapter). Metal drums (single-trip).

§ 173.375 Sodium azide.

(a) Sodium azide must be packed in specification containers as follows:

(1) Spec. 15A (§ 178.168 of this subchapter). Wooden boxes, with inside containers which must be securely closed paper bags, placed within a waterproof duplex bag, spec. 2J (§ 178.28 of this subchapter). Net weight of material is one outside box, not over 100 pounds.

§ 173.376 Aldrin and aldrin mixtures, dry, with more than 65 percent aldrin.

(a) Aldrin and aldrin mixtures, dry, with more than 65 percent aldrin, must be packed in specification containers as follows:

(1) As prescribed in § 173.365.

§ 173.377 Hexaethyl tetraphosphate mixtures; methyl parathion mixtures; organic phosphorus compound mixtures; organic phosphate compound mixtures; parathion mixtures; tetraethyl dithio pyrophosphate mixtures; and tetraethyl pyrophosphate mixtures, dry.

(a) Hexaethyl tetraphosphate mixtures, methyl parathion mixtures, organic phosphorus compound mixtures, organic phosphate compound mixtures, parathion mixtures, tetraethyl dithio pyrophosphate mixtures, and tetraethyl pyrophosphate mixtures in which the liquid is absorbed in concentrations greater than 2 percent but not exceeding 27 percent in an inert dry material so as to form a dry mixture, must be packed in specification containers as follows:

(1) Spec. 12B or 12C (§ 178.205 or 178.206 of this subchapter), fiberboard boxes, with inside containers which must be metal or fiber cans not over 12 pounds capacity each, or paper bags, spec. 2D, not over 12 pounds capacity each. Fiberboard boxes manufactured and marked for a gross weight of 65 pounds may have a gross weight of 70 pounds provided net weight of contents does not exceed 62 pounds. Inside containers and the completed package must be capable of withstanding the tests prescribed in paragraphs (c), (d), and (e) of this section.

(2) Spec. 15A or 15B (§§ 178.168 or 178.169 of this subchapter), wooden boxes, with inside containers which must be metal or fiber cans not over 12 pounds capacity each, or paper bags, spec. 2D (§ 178.23 of this subchapter), not over 12 pounds capacity each. Inside containers must be capable of withstanding the tests prescribed in paragraphs (c) and (d) of this section.

(3) Spec. 5, 5B, 6A or 6C (§§ 178.80, 178.82, 178.97, or 178.99 of this subchapter), metal barrels or drums.

(4) Spec. 17C, 17H or 37A (§§ 178.115, 178.118, or 178.131 of this subchapter), metal drums (single-trip). Spec. 37A metal drums authorized for not over 100 pounds net weight.

(5) Specification 21C (§ 178.224 of this subchapter). Fiber drums. Authorized net weight not over 250 pounds.

(b) Hexaethyl tetraphosphate mixtures, methyl parathion mixtures, organic phosphorus compound mixtures, organic phosphate compound mixtures, parathion mixtures, tetraethyl dithio pyrophosphate mixtures, and tetraethyl pyrophosphate mixtures in which the liquid is absorbed in concentrations greater than 27 percent in an inert dry material so as to form a dry mixture, must be packed in specification containers as follows:

(1) Spec. 12 B or 12C (§§ 178.205 or 178.206 of this subchapter), fiberboard boxes, with inside containers which must be metal cans not over 12 pounds capacity each. Inside containers and the completed package must be capable of withstanding the tests prescribed in paragraphs (c), and (e) of this section.

(2) Spec. 15A or 15B (§§ 178.168 or 178.169 of this subchapter), wooden boxes, with inside containers which must be metal cans not over 12 pounds capacity each. Inside containers must be capable of withstanding the tests prescribed in paragraph (c) of this section.

(3) Spec. 5, 5B, 6A, or 6C (§§ 178.80, 178.82, 178.97, or 178.99 of this subchapter), metal barrels or drums.

(4) Spec. 17C, 17H, or 37A (§§ 178.115, 178.118, or 178.131 of this subchapter), metal drums (single-trip). Spec. 37A metal drums authorized for not over 100 pounds net weight.

(5) Spec. 21C (§ 178.224 of this subchapter). Fiber drums. Authorized only for mixtures in which the liquid is absorbed in concentration not greater than 50 percent. Authorized net weight not over 225 pounds.

(c) Inside metal or fiber cans when closed as for shipment must be capable of withstanding two four-foot drops onto solid concrete without breakage of the container or any sifting of the contents. One drop must be on side of can and the other diagonally on the top rim or chime.

(d) Inside paper bags when closed as for shipment must be capable of withstanding two four-foot drops onto solid concrete without breakage of the container or any sifting of the contents. One drop must be made on bottom of bag and the other on either large face.

(e) Completed packages when closed as for shipment must be capable of with-

standing two four-foot drops onto solid concrete without breakage of the container or any sifting of the contents. One drop must be made on bottom of package and the other drop on the smallest adjacent side area.

(f) Dry mixtures containing not more than 2 percent by weight of hexaethyl tetraphosphate, methyl parathion, organic phosphorus compound mixtures, organic phosphate compound mixtures, parathion, tetraethyl dithio pyrophosphate, or tetraethyl pyrophosphate and in which the liquid is absorbed in an inert material, are excepted from specification packaging requirements of this Part.

(g) Dry mixtures containing more than 2 percent but not exceeding 15 percent by weight of hexaethyl tetraphosphate, methyl parathion mixtures, organic phosphorus compound mixtures, organic phosphate compound mixtures, parathion, tetraethyl dithio pyrophosphate, or tetraethyl pyrophosphate, and in which the liquid is absorbed in an inert material, in addition to containers prescribed in paragraphs (a) and (b) of this section, may be packed in specification containers as follows:

(1) Spec. 44B (§ 178.236 of this subchapter). Multiwall paper bags with inside paper bags, spec. 2D (§ 178.23 of this subchapter), not over 5 pounds capacity each. Net weight of material in outside container not over 30 pounds each.

(2) Spec. 12B (§ 178.205 of this subchapter). Fiberboard boxes constructed of at least 275-pound test double-faced fiberboard and provided with a perimeter liner and top and bottom pad of at least 275-pound test fiberboard. Product must be contained within a tightly closed polyethylene or other equally efficient plastic bag constructed of material having minimum thickness of 0.003 inch. Not more than 50 pounds net weight of product may be packed in one outside box.

(h) Dry mixtures containing more than 2 percent but not exceeding 5 percent by weight of hexaethyl tetraphosphate, methyl parathion mixtures, organic phosphorus compound mixtures, organic phosphate compound mixtures, parathion, tetraethyl dithiopyrophosphate, or tetraethyl pyrophosphate, and in which the liquid is absorbed in an inert material, in addition to containers prescribed in paragraphs (a), (b), and (g) of this section, may be packed in specification containers as follows:

(1) Spec. 44D (§ 178.238 of this subchapter). Multiwall paper bags not over 50 pounds net weight each. Where extensible kraft is used the minimum total basis weight shall be 260 pounds.

(i) Dry mixtures containing more than 2 percent but not exceeding 12 percent by weight of hexaethyl tetraphosphate, methyl parathion mixtures, organic phosphorus compound mixtures, organic phosphate compound mixtures, parathion, tetraethyl dithio pyrophosphate or tetraethyl pyrophosphate, and in which the liquid is absorbed in an inert material, in addition to containers prescribed in paragraphs (a), (b), and (g) of this section, may be packed in specification containers as follows:

(1) Spec. 44D (§ 178.238 of this subchapter). Multiwall paper bags not over 50 pounds net weight each. Outer ply to be not less than 60 pounds basis weight.

§ 173.378 [Reserved]

§ 173.379 Cyanogen bromide.

Cyanogen bromide must be packaged in tightly closed metal inside containers not over 1-pound capacity each, securely cushioned and packaged in an outside wooden box. Net weight may not exceed 25 pounds in one outside packaging.

§ 173.380 [Reserved]

§ 173.381 Irritating materials; Definition and general packaging requirements.

(a) For the purpose of Parts 170-189 of this subchapter, an irritating material is a liquid or solid substance which upon contact with fire or when exposed to air gives off dangerous or intensely irritating fumes, such as brombenzylcyanide, chloracetophenone, diphenylaminechlorarsine, and diphenylchlorarsine, but not including any poisonous material, Class A.

(b) *Cushioning.* All packagings must be hermetically closed. Inside packagings must be cushioned as prescribed when necessary to prevent breakage or leakage.

(c) *Outage.* No packaging used for the transportation of any liquid irritating material may be completely filled. For packagings with a capacity of 110 gallons

or less, sufficient outage must be provided so the packaging will not be liquid full at 130° F. (55° C.).

(d) The transportation of an irritating material is not permitted if there is any type of interconnection between packagings.

(e) Any pressure in a cylinder at 130° F. (55° C.) must not exceed $\frac{5}{4}$ the marked service pressure of the cylinder.

§ 173.382 Irritating materials, not specifically provided for.

(a) Irritating materials, as defined in § 173.381 for which special packaging is not otherwise prescribed, except as provided in paragraph (b) of this section, must be packaged as follows:

(1) Spec. 5, 5A, 5B or 5C (§ 178.80, 178.81, 178.82 or 178.83 of this subchapter) metal barrels or drums; or spec. 17C (single-trip) (§ 178.115 of this subchapter) metal drums not over 5 gallons capacity each.

(2) Spec. 6A, 6B, or 6C (§§ 178.97, 178.98, or 178.99 of this subchapter). Metal barrels or drums.

(3) Spec. 15A or 15B (§§ 178.168 or 178.169 of this subchapter). Wooden boxes with inside metal containers of not over 1 liquid gallon (10 rounds) capacity each. Not over 8 liquid gallons (80 pounds) of material may be packed in any outside container.

(4) *Cylinders* as prescribed for any compressed gas, except acetylene are also authorized for use. These cylinders must be qualified, maintained and filled in accordance with §§ 173.34 and 173.301 (g). If used for material with pressure exceeding 25 pounds per square inch at 70° F., they must also be retested as required by § 173.34.

(b) Chloroacetophene, diphenylaminechlorarsine, irritating material, n.o.s., or xylol bromide, charged with a non-flammable gas exceeding 25 psig at 70° F. must be packaged as specified in paragraph (a) (4) of this section.

§ 173.383 Chemical ammunition.

(a) Chemical ammunition consisting of projectiles, shells, bombs, or other containers, except grenades, filled with an irritating material without ignition elements, bursting charges, detonating fuzes, or other explosive components, must be packaged for shipment in strong outside wooden or metal boxes. Boxes must be marked with name of contents

and labeled as prescribed in this Part for gases, liquids, or chemicals contained therein.

(b) Chemical ammunition, when shipped as such must not be equipped or packed with explosive or ignition elements (see §§ 173.53(r) and 173.59 for explosive chemical ammunition)

§ 173.384 Monochloracetone, stabilized.

(a) Monochloracetone, stabilized, must be packed in specification containers as follows:

(1) Specification 5, 5A, or 17C (single-trip) (§§ 178.80, 178.81, 178.115 of this subchapter). Metal barrels or drums.

(2) Specification 15A, 15B, 15C, or 16A (§§ 178.168, 178.169, 178.170, 178.185 of this subchapter). Wooden boxes with inside glass bottles or tubes in metal cans hermetically sealed or with covers securely taped. The metal cans must be in corrugated fiberboard cartons, specification 2C (§ 178.22 of this subchapter). Bottles must not contain more than 1 pound of liquid each, must not be filled to more than 95 percent capacity, must be tightly and securely closed, and must be cushioned in cans with at least one-half inch of absorbent material. Cans must be made of metal at least 32-gauge U.S. Standard. The total amount of liquid per package must not exceed 24 pounds.

§ 173.385 Tear gas grenades, tear gas candles, or similar devices.

(a) Tear gas grenades, tear gas candles, or similar devices containing lachrymatory (tear producing) substances, for civil or military use must be packed in specification containers as follows (see § 173.101 (d) and (e) for packing tear gas cartridges):

(1) Specification 15A, 15B, or 15C (§§ 178.168, 178.169, 178.170 of this subchapter). Metal-strapped wooden boxes. Functioning elements not assembled in grenades or devices must be in a separate compartment of these boxes, or in inside or separate outside boxes, specification 15A, 15B, or 15C, and must be so packed and cushioned that they may not come in contact with each other or with the walls of boxes during transportation. Not more than 50 grenades and 50 functioning devices shall be packed in one package and the gross weight of the package must not exceed 75 pounds.

(2) Spec. 37A (§ 178.131 of this subchapter). Metal drum (single-trip). Functioning elements must be packed in

separate compartment. Not more than 24 grenades and 24 functioning devices shall be packed in one outside container and the gross weight of the container must not exceed 75 pounds.

(b) These articles must not be assembled with or packed in the same compartment with mechanically or manually operated firing, igniting bursting, or other functioning elements, unless of a type or design approved by the Bureau of Explosives.

(c) Pending approval by the Department of regulations classifying the numerous devices within the general descriptions of this section, and providing appropriate restrictions to be observed in the transportation thereof no shipment of packages containing articles under this section shall be made until samples thereof have been examined by the Bureau of Explosives or by other competent testing laboratory and the shipment is shown to possess such resistance to shocks of transportation and protection against leakage of contents as are afforded by standard types of packages described in Part 178 of this chapter, and the packages are labeled or marked to show compliance with this Part.

NOTE 1: Grenades or other similar devices may be shipped completely assembled when shipments are made by, for, or to the Departments of the Army, Navy, and Air Force of the United States Government, provided the functioning element is so packed that it cannot accidentally function. The outside containers must be metal-strapped wooden boxes, spec. 15A, 15B, or 15C (§§ 178.168, 178.169, or 178.170 of this subchapter).

§ 173.386 Etiologic agents; definition and scope.

(a) Definition. For the purpose of this subchapter:

(1) An "etiologic agent" means a viable microorganism, or its toxin, which causes or may cause human disease, and is limited to those agents listed in 42 Code of Federal Regulations 72.25(c) of the regulations of the U. S. Department of Health, Education, and Welfare.

(2) A "diagnostic specimen" means any human or animal material including, but not limited to, excreta, secreta, blood, and its components, tissue, and tissue fluids, being shipped for purposes of diagnosis.

(3) A "biological product" means a material prepared and manufactured in

accordance with the provisions of 9 CFR Part 102 (licensed veterinary biological products), 42 CFR Part 273 (licensed human biological products), 21 CFR Part 130, § 130.3 (new drugs for investigational use in humans), 9 CFR Part 103 (biological products for experimental treatment of animals), or 21 CFR Part 130, § 130.3a (new drugs for investigational use in animals), and which in accordance with these provisions, may be shipped in interstate commerce.

(b) *Applicability.* Except as provided in paragraph (d), no person may ship any material, including a diagnostic specimen or a biological product, containing an etiologic agent unless this material is packaged and prepared for shipment in accordance with § 173.24 and the other applicable regulations of this subchapter.

(c) *General provision.* The requirements of this subchapter supplement the requirements of the U. S. Department of Health, Education, and Welfare's regulations contained in 42 Code of Federal Regulations 72.25.

(d) *Exceptions.* The following substances are not subject to any requirements of this subchapter if the items as packaged do not contain any material otherwise subject to the requirements of this subchapter:

- (1) Diagnostic specimens; and
- (2) Biological products.
- (3) Cultures of etiologic agents of 50 milliliters (1.666 fluid ounces) or less total quantity in one outside package.

§ 173.387 Packaging requirements for etiologic agents.

(a) Except as provided in § 173.386(d) no person may ship a package containing over 4 liters gross volume of an etiologic agent.

(b) In addition to the requirements of 42 CFR 72.25(c), each package containing an etiologic agent must be designed and constructed so that, if it were subject to the environment and test conditions prescribed in this section, there would be no release of the contents to the environment, and the effectiveness of the packaging would not be significantly reduced.

(1) *Environmental conditions.* (i) Heat—direct sunlight in an ambient temperature of 130° F. in still air.

(ii) Cold—an ambient temperature of -40° F. in still air and shade.

(iii) Reduced pressure—ambient atmospheric pressure of 0.50 atmosphere (7.3 p.s.i.a.).

(iv) Vibration—vibration normally incident in the mode of transportation the package is to be shipped.

(2) *Test conditions.* (i) Water spray—a water spray heavy enough to keep the entire exposed surface of the package (except the bottom) continuously wet during a period of 30 minutes. Packages for which the outer layer consists of metal, wood, ceramic, or plastic, or combination thereof, are exempt from this test.

(ii) Freedrop—a freedrop through a distance of 30 feet onto a flat, essentially unyielding horizontal target surface, the package striking the surface in a position for which maximum damage is expected.

(iii) Penetration—impact of the hemispheric end of a steel cylinder 1.25 inches in diameter and weighing 15 pounds, dropped from a height of 40 inches on to the exposed surface of the package expected to be most vulnerable to puncture. The long axis of the cylinder must be perpendicular to the impacted surface. This test is not required for a package subject to subdivision (iv) of this subparagraph.

(iv) Penetration (required for packages exceeding 15 pounds gross weight only)—a freedrop of the package through a distance of 40 inches, striking the top end of a vertical cylindrical mild steel solid bar on an essentially unyielding surface, in a position for which maximum damage is expected. The bar must be 1.5 inches in diameter. The top of the bar must be horizontal, with its edge rounded to a radius not exceeding one-quarter inch. The bar must be of such length as to cause maximum damage to the package, but not less than 8 inches long. The long axis of the bar must be vertical to the unyielding horizontal impact surface of the package.

(3) *Testing procedure.* (i) At least one sample of each type package (maximum size and gross weight), filled with water, must be subjected to the water spray test unless exempted by subparagraph (2) (i) of this paragraph.

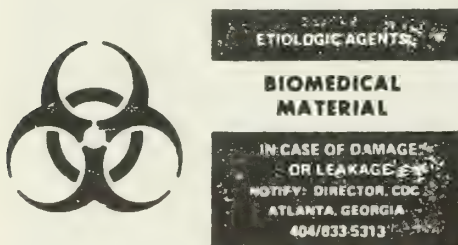
(ii) This sample package then must be given the freedrop and one of the penetration tests, as applicable. Separate wetted sample packages may be used for the freedrop and the penetration test.

(iii) If the sample package is exempted from the water spray test by sub-

paragraph (2)(i) of this paragraph, at least one sample of each type package (maximum size and gross weight), filled with water, must be subjected consecutively to the freedrop and the penetration test.

§ 173.388 Labeling of packages containing etiologic agents.

(a) Each package containing an etiologic agent, except a diagnostic specimen or a biological product, must be labeled as prescribed by the regulations of the U.S. Department of Health, Education, and Welfare, 42 CFR 72.25(c) (4). For information, this label is required to be a rectangle measuring 51 mm. (2 inches) high and 102.5 mm. (4 inches) long, predominantly red printing on a white background, and appears as follows:



§ 173.389 Radioactive materials; definitions.

For the purpose of this subchapter:

(a) "Fissile radioactive material" means the following material: Plutonium-238, plutonium-239, plutonium-241, uranium-233, or uranium-235, or any material containing any of the foregoing materials. See § 173.396(a) for exclusions. Fissile radioactive material packages are classified according to the controls needed to provide nuclear criticality safety during transportation as follows:

(1) *Fissile Class I*. Packages which may be transported in unlimited numbers and in any arrangement, and which require no nuclear criticality safety controls during transportation. For purposes of nuclear criticality safety control, a transport index is not assigned to Fissile Class I packages. However, the external radiation levels may require a transport index number.

(2) *Fissile Class II*. Packages which may be transported together in any arrangement but in numbers which do not exceed an aggregate transport index of 50. For purposes of nuclear criticality safety control, individual packages may have a transport index of not less than 0.1 and not more than 10. However, the external radiation levels may require a higher transport index number but not to exceed 10. Such shipments require no nuclear criticality safety control by the shipper during transportation.

(3) *Fissile Class III*. Shipments of packages which do not meet the requirements of Fissile Class I or II and which are controlled to provide nuclear criticality safety in transportation by special arrangements between the shipper and the carrier.

NOTE 1: Uranium-235 exists only in combination with various percentages of uranium-234 and uranium-238. "Fissile radioactive material" as applied to uranium-235 refers to the amount of uranium-235 actually contained in the total quantity of uranium being transported.

NOTE 2: Radioactive material may consist of mixtures of fissile and non-fissile radionuclides. "Fissile radioactive material" refers to the amount of plutonium-238, plutonium-239, plutonium-241, uranium-233, uranium-235, or any combination thereof actually contained in the mixture. The "radioactivity" of the mixture consists of the total activity of both the fissile and nonfissile radionuclides. All mixtures containing "fissile material" shall be subject to § 173.396.

(b) "Large quantity radioactive materials" means a quantity the aggregate radioactivity of which exceeds that specified as follows:

(1) Groups I or II (see paragraph (h) of this section) radionuclides: 20 curies.

(2) Groups III or IV radionuclides: 200 curies.

(3) Group V radionuclides: 5,000 curies.

(4) Groups VI or VII radionuclides: 50,000 curies.

(5) Special form material: 5,000 curies.

(c) "Low specific activity material" means any of the following:

(1) Uranium or thorium ores and physical or chemical concentrates of those ores;

(2) Unirradiated natural or depleted uranium or unirradiated natural thorium;

(3) Tritium oxide in aqueous solutions provided the concentration does

not exceed 5 millicuries per milliliter;

(4) Material in which the activity is essentially uniformly distributed and in which the estimated average concentration per gram of contents does not exceed:

- (i) 0.0001 millicuries of Group I (see § 173.389(h)) radionuclides; or
- (ii) 0.005 millicuries of Group II radionuclides; or
- (iii) 0.3 millicuries of Groups III or IV radionuclides.

Note: This includes, but is not limited to, materials of low radioactivity concentration such as residues or solutions from chemical processing; wastes such as building rubble, metal, wood, and fabric scrap, glassware, paper and cardboard; solid or liquid plant waste, sludges, and ashes.

(5) Objects of nonradioactive material externally contaminated with radioactive material, provided that the radioactive material is not readily dispersible and the surface contamination when averaged over an area of 1 square meter, does not exceed 0.0001 millicurie (220,000 disintegrations per minute) per square centimeter of Group I radionuclides or 0.001 millicurie (2,200,000 disintegrations per minute) per square centimeter of other radionuclides.

(d) "Normal form radioactive materials" means those which are not special form radioactive materials. Normal form radioactive materials are grouped into transport groups (see paragraph (h) of this section).

(e) "Radioactive material" means any material or combination of materials, which spontaneously emits ionizing radiation. Materials in which the estimated specific activity is not greater than 0.002 microcuries per gram of material, and in which the radioactivity is essentially uniformly distributed, are not considered to be radioactive materials.

(f) "Removable radioactive contamination" means radioactive contamination which can be readily removed in measurable quantities by wiping the contaminated surface with an absorbent material. The measurable quantities shall be considered as being not significant if they do not exceed the limits specified in § 173.397.

(g) "Special form radioactive materials" means those which, if released from a package, might present some direct radiation hazard but would pre-

sent little hazard due to radiotoxicity and little possibility of contamination. This may be the result of inherent properties of the material (such as metals or alloys), or acquired characteristics, as through encapsulation. The criteria for determining whether a material meets the definition of special form are prescribed in § 173.398(a).

(h) "Transport group" means any one of seven groups into which normal form radionuclides are classified according to their radiotoxicity and their relative potential hazard in transportation, and as listed in § 173.390.

(i) "Transport index" means the number placed on a package to designate the degree of control to be exercised by the carrier during transportation. The transport index to be assigned to a package of radioactive materials shall be determined by either subparagraph (1) or (2) of this paragraph, whichever is larger. The number expressing the transport index shall be rounded up to the next highest tenth; e.g., 1.01 becomes 1.1.

(1) The highest radiation dose rate, in millirem per hour at three feet from any accessible external surface of the package; or

(2) For Fissile Class II packages only the transport index number calculated by dividing the number "50" by the number of similar packages which may be transported together (see § 173.396), as determined by the procedures prescribed in the regulations of the U.S. Nuclear Regulatory Commission, Title 10, Code of Federal Regulations, Part 71.

(j) "Type A packaging" means packaging which is designed in accordance with the general packaging requirements of §§ 173.24 and 173.393, and which is adequate to prevent the loss or dispersal of the radioactive contents and to retain the efficiency of its radiation shielding properties if the package is subject to the tests prescribed in § 173.398(b).

(k) "Type B packaging" means packaging which meets the standards for Type A packaging, and, in addition, meets the standards for hypothetical accident conditions of transportation as prescribed in § 173.398(c).

(l) "Type A quantity" and "Type B quantity" radioactive materials means a quantity the aggregate radioactivity of

which does not exceed that specified as follows:

Transport group (see § 173.38v(b))	Type A quantity (in curies)	Type B quantity (in curies)
I.....	0.001	20
II.....	0.05	20
III.....	3	200
IV.....	20	200
V.....	20	5,000
VI and VII.....	1,000	50,000
Special form.....	20 ¹	5,000

¹ Except that for Californium-252 the Type A quantity limit for special form is 2 curies.

(m) *Containment system.* Containment system of a radioactive materials package means those components of the packaging including special form encapsulation where used, which have been specified by the package designer as intended to retain the radioactive contents during transport, whether or not individual vessels in the packaging retain their integrity of containment.

(n) *Maximum normal operating pressure.* Maximum normal operating pressure means the maximum pressure above atmospheric pressure at mean sea level that would develop in the containment system in a period of 1 year, under the conditions of temperature and solar radiation corresponding to environmental conditions of transport in the

absence of venting, external cooling by an ancillary system, or operational controls during transport.

(o) "Exclusive Use" (also referred to as "sole use" or "Full Load" as used in IAEA regulations) means any shipment:

(1) From a single consignor having the exclusive use of a transport vehicle; and

(2) For which all initial, intermediate, and final loading and unloading is carried out by or under the direction of the consignor, consignee, or his designated agent.

(p) "Radioactive Device" means any manufactured article such as an instrument, clock, electronic tube or apparatus, or similar device having radioactive material (other than liquid) in a nondispersible form as a component part.

(q) "Closed transport vehicle" means a vehicle equipped with a securely attached exterior enclosure, which during normal transport, restricts the access of unauthorized persons to the cargo space containing the radioactive materials. The enclosure may be either temporary or permanent, may be of the "see-through" type, and must limit access from top, sides, and ends.

§ 173.390 Transport groups of radionuclides.

(a) List of radionuclides:

Element ¹	Radionuclide ²	Transport group						
		I	II	III	IV	V	VI	VII
Actinium (89).....	Ac-227.....	X						
	Ac-228.....	X						
Americium (95).....	Am-241.....	X						
	Am-243.....	X						
Antimony (51).....	Sb-122.....				X			
	Sb-124.....			X				
	Sb-125.....			X				
Argon (18).....	Ar-37.....						X	
	Ar-41.....		X					
Arsenic (33).....	As-73 (uncompressed) ³					X		
	As-73.....				X			
	As-74.....				X			
	As-76.....				X			
	As-77.....				X			
Astatine (85).....	At-211.....			X				
Barium (56).....	Ba-131.....				X			
	Ba-133.....		X					
	Ba-140.....			X				
Berkelium (97).....	Bk-249.....	X						
Beryllium (4).....	Be-7.....				X			
Bismuth (83).....	Bi-208.....				X			
	Bi-207.....			X				
	Bi-210.....		X					
	Bi-212.....			X				
Bromine (35).....	Br-82.....				X			
Cadmium (48).....	Cd-109.....				X			
	Cd-115m.....			X				
	Cd-116.....				X			
Calcium (20).....	Ca-45.....				X			
	Ca-47.....				X			
Californium (98).....	Cf-249.....	X						
	Cf-250.....	X						
	Cf-252.....	X						
Carbon (6).....	C-14.....				X			
Cerium (58).....	Ce-141.....				X			
	Ce-143.....				X			
	Ce-144.....			X				
Cesium (55).....	Cs-131.....				X			
	Cs-134m.....			X				
	Cs-134.....			X				
	Cs-135.....				X			
	Cs-136.....				X			
	Cs-137.....			X				
Chlorine (17).....	Cl-36.....			X				
	Cl-38.....				X			
Chromium (24).....	Cr-51.....				X			
Cobalt (27).....	Co-56.....			X				
	Co-57.....				X			
	Co-58m.....				X			
	Co-58.....				X			
	Co-60.....			X				
Copper (29).....	Cu-64.....				X			
Curium (96).....	Cm-242.....	X						
	Cm-243.....	X						
	Cm-244.....	X						
	Cm-245.....	X						
	Cm-246.....	X						
Dysprosium (66).....	Dy-164.....			X				
	Dy-165.....				X			
	Dy-166.....				X			
Erbium (68).....	Er-169.....				X			
	Er-171.....				X			
Europium (63).....	Eu-150.....			X				
	Eu-152m.....				X			
	Eu-152.....			X				
	Eu-154.....		X					
	Eu-155.....				X			
Fluorine (9).....	F-18.....				X			
Gadolinium (64).....	Gd-153.....				X			
	Gd-159.....				X			

See footnotes at end of table.

Element ¹	Radionuclide ²	Transport group						
		I	II	III	IV	V	VI	VII
Gallium (31)	Ga-67			X				
	Ga-72				X			
	Ge-71				X			
Germanium (32)	Au-193			X				
Gold (79)	Au-194			X				
	Au-195			X				
	Au-196				X			
	Au-198				X			
	Au-199				X			
Hafnium (72)	Hf-181				X			
Holmium (67)	Ho-166				X			
Hydrogen (1)	H-3 (see tritium)							
Indium (49)	In-113m				X			
	In-114m			X				
	In-115m				X			
	In-115				X			
Iodine (53)	I-124			X				
	I-125			X				
	I-126			X				
	I-129			X				
	I-131			X				
	I-132				X			
	I-133			X				
	I-134				X			
Iridium (77)	Ir-190				X			
	Ir-192			X				
	Ir-194				X			
	Fe-55				X			
Iron (26)	Fe-59				X			
	Fe-60				X			
Krypton (36)	Kr-85m			X				
	Kr-85m (uncompressed) ³					X		
	Kr-86			X				
	Kr-85 (uncompressed) ³						X	
	Kr-97			X				
	Kr-87 (uncompressed) ³					X		
Lanthanum (57)	La-140				X			
Lead (82)	Pb-203				X			
	Pb-210			X				
	Pb-212			X				
Lutetium (71)	Lu-177			X				
	Lu-177				X			
Magnesium (12)	Mg-28				X			
Manganese (25)	Mn-52				X			
	Mn-54				X			
	Mn-56				X			
Mercury (80)	Hg-197m				X			
	Hg-197				X			
	Hg-203				X			
	Hg-203				X			
Mixed Fission Products	MFP			X				
Molybdenum (42)	Mo-99				X			
Neodymium (60)	Nd-147				X			
	Nd-149				X			
Neptunium (93)	Np-237		X					
	Np-239		X					
Nickel (28)	Ni-56			X				
	Ni-59				X			
	Ni-63				X			
	Ni-65				X			
Niobium (41)	Nb-93m				X			
	Nb-95				X			
	Nb-97				X			
Osmium (76)	Os-185				X			
	Os-191m				X			
	Os-191				X			
	Os-193				X			
Palladium (46)	Pd-103				X			
	Pd-109				X			
Phosphorus (15)	P-32				X			
Platinum (78)	Pt-191				X			
	Pt-193				X			
	Pt-195m				X			
	Pt-197m				X			
	Pt-197				X			
Plutonium (94)	Pu-238 ⁴	X						
	Pu-239 ⁴	X						
	Pu-240	X						
	Pu-241 ⁴	X						
	Pu-242	X						
Polonium (84)	Po-210	X						
Potassium (19)	K-42				X			
	K-43			X				

See footnotes at end of table

Element ¹	Radionuclide ¹	Transport group						
		I	II	III	IV	V	VI	VII
Praseodymium (59).....	Pr-142.....				X			
	Pr-143.....				X			
Promethium (61).....	Pm-147.....				X			
	Pm-149.....				X			
Protactinium (91).....	Pa-230.....	X						
	Pa-231.....	X						
	Pa-233.....		X					
	Pa-223.....		X					
Radium (88).....	Ra-224.....		X					
	Ra-226.....	X						
	Ra-228.....	X						
	Rn-220.....				X			
Radon (86).....	Rn-222.....		X					
	Re-183.....				X			
Rhenium (75).....	Re-186.....				X			
	Re-187.....				X			
	Re-188.....				X			
	Re Natural.....				X			
	Rh-103m.....				X			
Rhodium (45).....	Rh-105.....				X			
	Rb-86.....				X			
Rubidium (37).....	Rb-87.....				X			
	Rb Natural.....				X			
Ruthenium (44).....	Ru-97.....				X			
	Ru-103.....				X			
	Ru-105.....				X			
	Ru-106.....			X				
Samarium (62).....	Sm-145.....			X				
	Sm-147.....			X				
	Sm-151.....				X			
	Sm-153.....				X			
Scandium (21).....	Sc-46.....			X				
	Sc-47.....				X			
	Sc-48.....				X			
	Sc-75.....				X			
Selenium (34).....	Se-81.....				X			
Silicon (14).....	Si-31.....				X			
Silver (47).....	Ag-106.....				X			
	Ag-110m.....			X				
	Ag-111.....				X			
Sodium (11).....	Na-22.....			X				
	Na-24.....				X			
Strontium (38).....	Sr-85m.....				X			
	Sr-85.....				X			
	Sr-89.....			X				
	Sr-90.....		X					
	Sr-91.....			X				
Sulphur (16).....	Sr-92.....				X			
	S-35.....				X			
Tantalum (73).....	Ta-182.....			X				
Technetium (43).....	Tc-96m.....				X			
	Tc-96.....				X			
	Tc-97m.....				X			
	Tc-97.....				X			
	Tc-99m.....				X			
Tellurium (52).....	Tc-99.....				X			
	Te-125m.....				X			
	Te-127m.....				X			
	Te-127.....				X			
	Te-129m.....			X				
	Te-129.....				X			
	Te-131m.....			X				
Terbium (65).....	Te-132.....				X			
	Tb-160.....			X				
Thallium (81).....	Tl-200.....				X			
	Tl-201.....				X			
	Tl-202.....				X			
	Tl-204.....			X				
Thorium (90).....	Th-227.....		X					
	Th-228.....	X						
	Th-230.....	X						
	Th-231.....	X						
	Th-232.....			X				
	Th-234.....		X					
Thulium (69).....	Th Natural.....			X				
	Tm-169.....			X				
	Tm-170.....			X				
	Tm-171.....				X			
Tin (50).....	Sn-113.....				X			
	Sn-117m.....			X				
	Sn-121.....			X				
	Sn-125.....				X			

See footnotes at end of table.

Element ¹	Radionuclide ²	Transport group						
		I	II	III	IV	V	VI	VII
Tritium (1)	H-3					X		
	H-3 (as a gas, as luminous paint, or adsorbed on solid material)							X
Tungsten (74)	W-181					X		
	W-185					X		
	W-187					X		
Uranium (92)	U-230			X				
	U-232		X					
	U-233 ⁴		X					
	U-234		X					
	U-235 ⁴			X				
	U-236		X					
	U-238			X				
	U Natural			X				
Vanadium (23)	U Enriched ⁴			X				
	U Depleted			X				
	V-48					X		
	V-49			X				
Xenon (54)	Xe-125			X				
	Xe-131m			X				
	Xe-131m (uncompressed) ³					X		
	Xe-133			X				
	Xe-133 (uncompressed) ³						X	
	Xe-135		X					
	Xe-135 (uncompressed) ³					X		
Ytterbium (70)	Yb-175					X		
Yttrium (39)	Y-88			X				
	Y-90					X		
	Y-91m			X				
	Y-91			X				
	Y-92					X		
	Y-93					X		
	Zn-65					X		
Zinc (30)	Zn-69m					X		
	Zn-69					X		
Zirconium (40)	Zr-93					X		
	Zr-95			X				
	Zr-97					X		

¹ Atomic number shown in parentheses.

² Uncompressed means at a pressure not exceeding 14.7 p.s.i. (absolute).

³ Atomic weight shown after the radionuclide symbol.

⁴ Fissile radioactive material.

(b) Any radionuclide not listed in the above table shall be assigned to one of the groups in accordance with the following table:

Radionuclide	Radioactive half-life		
	0-1,000 days	1,000 days to 10 ⁴ years	Over 10 ⁴ years
Atomic number 1-81.	Group III.	Group II...	Group III.
Atomic number 82 and over.	Group I.	Group I....	Do.

NOTE 1: No unlisted radionuclides shall be assigned to Groups IV, V, VI, or VII.

(c) For mixtures of radionuclides the following shall apply:

(1) If the identity and respective activity of each radionuclide are known, the permissible activity of each radionuclide shall be such that the sum, for all groups present, of the ratio between the total activity for each group to the permissible activity for each group will not be greater than unity.

(2) If the groups of the radionuclides are known but the amount in each group cannot be reasonably determined, the mixture shall be assigned to the most restrictive group present.

(3) If the identity of all or some of the radionuclides cannot be reasonably determined, each of those unidentified radionuclides shall be considered as belonging to the most restrictive group which cannot be positively excluded.

(4) Mixtures consisting of a single radioactive decay chain where the radionuclides are in the naturally occurring proportions shall be considered as consisting of a single radionuclide. The group and activity shall be that of the first member present in the chain, except if a radionuclide "x" has a half-life longer than that of that first member and an activity greater than that of any other member including the first at any time during transportation; in that case, the transport group of the nuclide "x" and the activity of the mixture shall be the

maximum activity of that nuclide "x" during transportation.

§ 173.391 Limited quantities of radioactive materials and radioactive devices.

(a) Limited quantities of radioactive materials in normal form not exceeding 0.01 millicurie of Group I radionuclides; 0.1 millicurie of Group II radionuclides; 1 millicurie of Groups III, IV, V, or VI radionuclides; 25 curies of Group VII radionuclides; tritium oxide in aqueous solution with a concentration not exceeding 0.5 millicuries per milliliter and with a total activity per package of not more than 3 curies; or 1 millicurie of radioactive material in special form; and not containing more than 15 grams of uranium-235 are excepted from specification packaging, marking, and labeling, and are excepted from the provisions of § 173.393, if the following conditions are met:

(1) The materials are packaged in strong tight packages such that there will be no leakage of radioactive materials under conditions normally incident to transportation.

(2) The package must be such that the radiation dose rate at any point on the external surface of the package does not exceed 0.5 millirem per hour.

(3) There must be no significant removable radioactive surface contamination on the exterior of the package (see § 173.397).

(4) The outside of the inner container must bear the marking "Radioactive."

(b) Manufactured articles such as instruments, clocks, electronic tubes or apparatus, or other similar devices, having limited quantities of radioactive materials (other than liquids) in a non-dispersible form as a component part, are excepted from specification packaging, marking, and labeling, and are excepted from the provisions of § 173.393, if the following conditions are met:

NOTE 1: For radioactive gases, the requirement for the radioactive material to be in a nondispersible form does not apply.

(1) Radioactive materials are securely contained within the devices, or are securely packaged in strong, tight packages, so that there will be no leakage of radioactive materials under conditions normally incident to transportation.

(2) The radiation dose rate at four inches from any unpackaged device does not exceed 10 millirem per hour.

(3) The radiation dose rate at any point on the external surface of the outside of the package may not exceed 0.5 millirem per hour. However, for exclusive use shipments only, the radiation at the external surface of the package or the item may exceed 0.5 millirem per hour, but must not exceed 2 millirem per hour.

(4) There must be no significant removable radioactive surface contamination on the exterior of the package (see § 173.397).

(5) The total radioactivity content of a package containing radioactive devices must not exceed the quantities shown in the following table:

Transport group	Quantity in curies	
	Per device	Per package
I.....	0.0001	0.001
II.....	0.001	0.05
III.....	0.01	3
IV.....	0.05	3
V or VI.....	1	1
VII.....	25	200
Special form.....	0.05	20

(6) No package may contain more than 15 grams of fissile material.

(c) A manufactured article, other than a reactor fuel element, in which the only radioactive material is metallic natural or depleted uranium or natural thorium or alloys thereof, is excepted from specification packaging, marking, and labeling, and is excepted from the provisions of § 173.393, if the following conditions are met:

(1) The radiation dose rate at any point on the external surface of the outside container does not exceed 0.5 millirem per hour:

(2) There must be no significant radioactive surface contamination on the exterior of the package. To determine whether "significant," the standard in § 173.397 must be used.

(3) The total radioactivity content of each article must not exceed 3 curies.

(4) The outer surface of the uranium or thorium is enclosed in a non-radioactive, sealed, metallic sheath.

NOTE: Such articles may be packagings for the transportation of radioactive materials.

§ 173.392 Low specific activity radioactive material.

(a) Low specific activity (LSA) radioactive materials, other than materials consigned as exclusive use, are exempt from the provisions of § 173.393(a) through (e) and (g). However, they must be packaged in accordance with the requirements of § 173.395 and must be marked and labeled as required in §§ 172.300 and 172.400 of this subchapter.

(b) LSA radioactive materials which are transported in a transport vehicle and consigned as exclusive use are exempt from specification packaging, marking, and labeling, provided the shipment meets the requirements of paragraph (c) or (d) of this section.

(c) Packaged shipments of low specific activity materials transported in transport vehicles assigned for the sole use of that consignor must comply with the following:

(1) Materials must be packaged in strong, tight packages so that there will be no leakage of radioactive material under conditions normally incident to transportation.

(2) Packages must not have any significant removable surface contamination (see § 173.397).

(3) External radiation levels must comply with § 173.393(j).

(4) Shipments must be loaded by consignor and unloaded by consignee from the transport vehicle in which originally loaded.

(5) There must be no loose radioactive material in the vehicle.

(6) Shipment must be braced so as to prevent leakage or shift of lading under conditions normally incident to transportation.

(7) Except for shipments of uranium or thorium ores, unconcentrated, the transport vehicle must be placarded with the placards prescribed in accordance with § 172.500 of this subchapter, as appropriate.

(8) The outside of each outside package must be stencilled or otherwise marked "Radioactive—LSA."

(9) Specific instructions for maintenance of exclusive use (sole use) shipment controls must be provided by the shipper to the carrier. Such instructions

must be included with the shipping paper information.

(d) Unpackaged (bulk) shipments of low specific activity materials transported in closed transport vehicles assigned for the sole use of that consignor must comply with the following:

(1) Authorized materials are limited to the following:

(i) Uranium or thorium ores and physical or chemical concentrates of those ores.

(ii) Uranium metal or natural thorium metal, or alloys of these materials; or

(iii) Materials of low radioactive concentration, if the average estimated radioactivity concentration does not exceed 0.001 millicurie per gram and the contribution from Group I material does not exceed one percent of the total radioactivity.

(iv) Objects of nonradioactive material externally contaminated with radioactive material. If the radioactive material is not readily dispersible and the surface contamination, when averaged over one square meter, does not exceed 0.0001 millicurie per square centimeter of Group I radionuclides or 0.001 millicurie per square centimeter of other radionuclides. Such objects must be suitably wrapped or enclosed.

(2) Bulk liquids must be transported in the following:

(i) [Reserved]

(ii) Spec. MC 310, MC 311, MC 312, or MC 331 (§ 178.330, § 178.331, § 178.337, or § 178.343 of this subchapter) cargo tanks. Authorized only where the radioactivity concentration does not exceed 10 percent of the specified low specific activity levels (see § 173.389(c)). The requirements of § 173.393(e) do not apply to these cargo tanks. Bottom fittings and valves are not authorized.

(3) External radiation levels must comply with subparagraphs (2), (3), and (4) of § 173.393(j).

(4) Shipments must be loaded by the consignor, and unloaded by the consignee from the transport vehicles in which originally loaded.

(5) Except for shipments of uranium or thorium ores, unconcentrated, the transport vehicle must be placarded with

the placards prescribed in accordance with § 172.500 of this subchapter, as appropriate.

(6) There must be no leakage of radioactive materials from the vehicle.

(7) Specific instructions for maintenance of exclusive use (sole use) shipment controls must be provided by the shipper to the carrier. Such instructions must be included with the shipping paper information.

§ 173.393 General packaging and shipment requirements.

(a) Unless otherwise specified, all shipments of radioactive materials must meet all requirements of this section, and must be packaged as prescribed in §§ 173.391 through 173.396.

(b) The outside of each package must incorporate a feature such as a seal, which is not readily breakable and which, while intact, will be evidence that the package has not been illicitly opened.

(c) The smallest outside dimension of any package must be 4 inches or greater.

(d) Each radioactive material must be packaged in a packaging which has been designed to maintain shielding efficiency and leak tightness, so that, under conditions normally incident to transportation, there will be no release of radioactive material. If necessary, additional suitable inside packaging must be used. Each package must be capable of meeting the standards in §§ 173.398(b) and 173.24.

(1) Internal bracing or cushioning where used, must be adequate to assure that, under the conditions normally incident to transportation, the distance from the inner container or radioactive material to the outside wall of the package remains within the limits for which the package design was based, and the radiation dose rate external to the package does not exceed the transport index number shown on the label. Inner shield closures must be positively secured to prevent loss of the contents.

(e) The packaging must be designed, constructed, and loaded so that during transport:

(1) The heat generated within the package because of the radioactive materials present will not, at any time dur-

ing transportation, affect the efficiency of the package under the conditions normally incident to transportation, and

(2) The temperature of the accessible external surfaces of the package will not exceed 122° F. in the shade when fully loaded, assuming still air at ambient temperature. If the package is transported in a transport vehicle consigned for the sole use of the consignor, the maximum accessible external surface temperature shall be 180° F.

(f) Pyrophoric materials, in addition to the packaging prescribed in this subpart, must also meet the packaging requirements of § 173.134 or § 173.154.

(g) Liquid radioactive material in Type A quantities must be packaged in or within a leak-resistant and corrosion-resistant inner containment vessel. In addition:

(1) The packaging must be adequate to prevent loss or dispersal of the radioactive contents from the inner containment vessel if the package were subjected to the 9 meter (30-foot) drop test prescribed in § 173.398(c) (2) (i); and either

(2) Enough absorbent material must be provided to absorb at least twice the volume of radioactive liquid contents. The absorbent material may be located outside the radiation shield only if it can be shown that if the radioactive liquid contents were taken up by the absorbent material the resultant dose rate at the surface of the package would not exceed 1,000 millirem per hour; or

(3) A secondary leak-resistant and corrosion-resistant containment vessel must be provided to retain the radioactive contents under the normal conditions of transport as prescribed in § 173.398(b), assuming the failure of the inner primary containment vessel.

(h) There must be no significant removable radioactive surface contamination on the exterior of the package (see § 173.397).

(i) Except for shipments described in paragraph (j) of this section, all radioactive materials must be packaged in suitable packaging (shielded, if necessary) so that at any time during the normal conditions incident to transportation the radiation dose rate does not exceed 200 millirem per hour at any point on the external surface of the package,

and the transport index does not exceed 10.

(j) Packages for which the radiation dose rate exceeds the limits specified in paragraph (i) of this section, but does not exceed at any time during transportation any of the limits specified in paragraphs (j) (1) through (4) of this section may be transported in a transport vehicle which has been consigned as exclusive use. Specific instructions for maintenance of the exclusive use (sole use) shipment controls must be provided by the shipper to the carrier. Such instructions must be included with the shipping paper information:

(1) 1,000 millirem per hour at 3 feet from the external surface of the package (closed transport vehicle only).

(2) 200 millirem per hour at any point on the external surface of the vehicle (closed transport vehicle only).

(3) Ten millirem per hour at any point 2 meters (six feet) from the vertical planes projected by the outer lateral surface of the vehicle; or if the load is transported in an open transport vehicle, at any point 2 meters (six feet) from the vertical planes projected from the outer edges of the vehicle.

(4) 2 millirem per hour in any normally occupied position in the vehicle, except that this provision does not apply to private motor carriers.

(k) [Reserved]

(1) Packages consigned for export are also subject to the regulations of the foreign governments involved in the shipment. See §§ 173.8, 173.9, and 173.393b. (The regulations of the International Atomic Energy Agency (IAEA) are used by most foreign governments.)

(m) Prior to the first shipment of any package, the shipper shall determine by examination or appropriate test that:

(1) The packaging meets the specified quality of design and construction; and

(2) The effectiveness of the shielding and containment, and, where necessary, the heat transfer characteristics of the package are within the limits applicable to or specified for the package design.

(n) Prior to each shipment of any package, the shipper shall insure by examination or appropriate test that:

(1) The package is proper for the contents to be shipped;

(2) The packaging is in unimpaired physical condition except for superficial marks;

(3) Each closure device of the packaging, including any required gasket, is properly installed and secured and free of defects;

(4) For a fissile material, any moderator and neutron absorber, if required, is present in proper condition;

(5) Any special instructions for filling, closing, and preparation of the package for shipment have been followed;

(6) Each closure, valve, and any other opening of the containment system through which the radioactive content might escape is properly closed and sealed;

(7) Each package containing liquid in excess of a Type A quantity and destined for air shipment is tested to demonstrate that it is leak tight under an ambient atmospheric pressure differential of at least 0.5 atmosphere (absolute) (7.3 p.s.i.a. or 0.5 kg./cm.²); the test may be conducted on the entire containment system or on any receptacle or vessel within the containment system, as appropriate to determine compliance with the requirement;

(8) If the maximum normal operating pressure of a package is likely to exceed 0.35 kg./cm.² (gage), the internal pressure of the containment system will not exceed the design pressure during transportation; and

(9) External radiation and contamination levels are within the allowable limits.

(o) No person may offer for transportation a package of radioactive materials until the temperature of the packaging system has reached equilibrium (see also paragraph (e) of this section) unless, for the specific contents, he has ascertained that the maximum applicable surface temperature limits cannot be exceeded.

§ 173.393a U.S. Atomic Energy Commission approved packages; standard requirements and conditions.

(a) In addition to the applicable requirements of the USAEC approval and Parts 170-199 of this subchapter, each shipper of a package containing radioactive material, which has been approved by the U.S. Atomic Energy Commission in accordance with § 173.394(b) (3), (c) (2), § 173.395(b) (2), (c) (2), § 173.396(b) (4), or § 173.396(c) (3), also shall comply with the following:

(1) Before the first shipment in a package approved by the U.S. Atomic Energy Commission for use by another person, each shipper shall register in writing with the USAEC, Division of Materials Licensing, his name and address, the name of the person to whom the USAEC approval was issued, and the approval number assigned to the package. Each shipper shall have a copy of the USAEC approval and the document referred to in the approval in his possession. Each shipment must be made in compliance with the terms and conditions of the approval;

(2) The outside of each package must be durably and legibly marked with the package identification marking indicated in the USAEC approval;

(3) Each shipping paper related to the shipment of this package must bear a notation of the package identification marking indicated in the USAEC approval;

(4) Before the first export shipment of the package, the shipper shall submit a copy of the applicable competent authority certificate applying to that package design to the competent national authority of each country into or through which the package will be transported, unless a copy has already been furnished to this party by another person. (Detailed requirements for the issuance and content of competent authority certificates are provided in marginal C-6 of the IAEA "Regulations for the Safe Transport of Radioactive Materials, safety series No. 6, 1967 edition," hereinafter referred to as the "IAEA Regulations." A list of the national competent authorities of each country is published annually by the IAEA.);

(5) Each package of fissile radioactive material must be marked with the numerical value for the transport index if the shipment is fissile class II. Any

vehicle limitation indicated in the USAEC approval applies if the shipment is fissile class III; and

(6) For a fissile class III shipment the statement prescribed in § 173.427(a) (5) (v) must be included with the shipping papers.

§ 173.393b International shipments and foreign-made packages; standard requirements and conditions.

(a) In addition to the other applicable requirements of this subchapter, each shipper of a package containing radioactive material, for which a foreign competent authority certificate has been issued and revalidated pursuant to the IAEA regulations and § 173.394(b) (4), § 173.394(c) (3), § 173.395(b) (3), § 173.395(c) (3), § 173.396(b) (5), or § 173.396(c) (4), also shall comply with the following:

(1) Before the first shipment of the package, each shipper shall register in writing his identity and type of package with the Office of Hazardous Materials, U.S. Department of Transportation, Washington, D.C. 20590, furnishing a copy of the foreign certificate or revalidation thereof which is applicable to that package, unless a copy has already been furnished by another person;

(2) The outside of each package must be durably and legibly marked with the competent authority identification marking indicated on the certificate or revalidation;

(3) Each shipping paper related to the shipment of the package must bear a notation of the package identification marking indicated in the certificate or revalidation;

(4) Before the first export shipment of the package, the shipper shall furnish a copy of the applicable competent authority certificate applying to that package design and any required revalidation, to the competent national authority of each country through or into which the package will be transported, unless a copy has already been furnished by another person;

(5) The applicable competent authority certificates need not accompany the packages to which they relate. However, the shipper shall supply them to the carrier upon request; and

(6) For a fissile class III shipment, the statement prescribed in § 173.427(a)

(5)(v) must be included with the shipping papers.

(b) The designated competent authority in the USA responsible for administering the requirements (Marginal C-6) of the International Atomic Energy Agency's (IAEA) "Regulations for the Safe Transport of Radioactive Materials," Safety Series No. 6, 1967 Edition, is:

Office of Hazardous Materials, U.S. Department of Transportation, Washington, D.C. 20590.

(c) Any request for a competent authority certificate required by the IAEA regulations must be submitted in writing to the address given in paragraph (b) of this section. This request should be in duplicate and must contain all the information required by the applicable subsection of Marginal C-6 of the IAEA regulations. Unless there is good reason for priority treatment, each request will be considered in the order in which it is received. To permit timely consideration, requests should be submitted at least 45 days prior to the requested effective date.

§ 173.394 Radioactive material in special form.

(a) In addition to the applicable requirements of §§ 173.24 and 173.393, a Type A quantity of special form radioactive material must be packaged as follows:

(1) Specification 7A (§ 178.350 of this subchapter) Type A general packaging. Each shipper of a Specification 7A packaging must maintain on file for at least one year after the latest shipment, and be prepared to provide the Department, a complete certification and supporting safety analysis demonstrating that the construction methods, packaging design, and materials of construction are in compliance with the specification. This requirement is effective December 31, 1975.

(2) Specification 55 (§ 178.250 of this subchapter) metal encased shielded container. Use of existing container authorized; construction not authorized after March 31, 1975.

(3) Any Type B packaging pursuant to paragraph (b) of this section.

(4) Foreign-made packagings which bear the marking "TYPE A."

(b) Type B quantities of special form radioactive materials must be packaged as follows:

(1) Specification 55 metal encased shielded container. Authorized only for domestic shipments of not more than 300 curies per package. Use of existing container authorized; construction not authorized after March 31, 1975.

(2) Specification 6M (§ 178.104 of this subchapter) metal packaging.

(3) Any other Type B packaging approved by the U.S. Atomic Energy Commission.

(4) Any other Type B packaging which meets the pertinent requirements in the 1967 regulations of the International Atomic Energy Agency, and for which the foreign competent authority certificate has been revalidated by the Department.

(5) Specification 20WC (§ 178.194 of this subchapter) wooden outer protective jacket, with a single snug-fitting inner Type A packaging which has a metal outer wall and conforms to § 178.350 of this subchapter or Specification 55. Only use of existing specification 55 container authorized; construction not authorized after March 31, 1975.

(6) Specification 21WC (§ 178.195 of this subchapter) wooden-steel protective overpack, with a single inner specification 2R (§ 178.34 of this subchapter) or specification 55, inner packaging. Only use of existing specification 55 container authorized; construction not authorized after March 31, 1975. Contents must be loaded within the inner packaging to preclude loose movement during transportation. The inner packaging must be securely positioned and centered within the overpack by solid cushioning materials so that there would be no significant displacement of the inner packaging if the packaging were subjected to the 9 meter (30-foot) drop test described in § 173.398(c)(1).

(c) Large quantities of radioactive materials in special form must be packaged as follows:

(1) Spec. 6M (§ 178.104 of this subchapter) metal packaging. Radioactive thermal decay energy must not exceed to watts.

(2) Any other Type B packaging which meets the pertinent requirements for large quantities of radioactive materials in the regulations of the U.S. Atomic Energy Commission (10 CFR Part 71) and is approved by the U.S. Atomic Energy Commission.

(3) Any other Type B packaging which meets the pertinent requirements for large quantities of radioactive materials

in the 1967 regulations of the International Atomic Energy Agency, and for which the foreign competent authority certificate has been revalidated by the Department.

(4) Specifications 20WC (§ 178.194 of this subchapter) wooden outer protective jacket, with a single, snug-fitting specification 55 inner packaging. Only use of existing specification 55 container authorized; construction not authorized after March 31, 1975. Radioactive thermal decay energy must not exceed 100 watts.

§ 173.395 Radioactive material in normal form.

(a) In addition to the applicable requirements of §§ 173.24 and 173.393, a Type A quantity of normal form radioactive material must be packaged as follows:

(1) Specification 7A (§ 178.350 of this subchapter) Type A general packaging. Each shipper of a specification 7A packaging must maintain on file for at least one year after the latest shipment, and be prepared to provide the Department, a complete certification and supporting safety analysis demonstrating that the construction methods, packaging design, and materials of construction are in compliance with the specification.

(2) Specification 55 metal encased shielded container. Use of existing container authorized; construction not authorized after March 31, 1975. For liquid contents the provisions of § 173.393(g) must also be met.

(3) Any Type B packaging pursuant to paragraph (b) of this section.

(4) Foreign-made packagings which bear the marking "TYPE A."

(b) Type B quantities of radioactive materials in normal form must be packaged as follows:

(1) Spec. 6M (§ 178.104 of this subchapter) metal packaging. Authorized only for solid or gaseous radioactive materials which will not decompose at temperatures up to 250° F.

(2) Any other Type B packaging approved by the U.S. Atomic Energy Commission.

(3) Any other Type B packaging which meets the pertinent requirements in the 1967 regulations of the International Atomic Energy Agency, and for which the foreign competent authority certificate has been revalidated by the Department.

(4) Specification 20WC (§ 178.194 of this subchapter) wooden outer protective jacket, when used with a single, snug-fitting inner specification 2R (§ 178.34 of this subchapter) or specification 55 inner packaging. Only use of existing specification 55 container authorized; construction not authorized after March 31, 1975. For liquid contents the provisions of § 173.393(g) must also be met, with respect to the inner packaging.

(c) Large quantities of radioactive materials in normal form must be packaged as follows:

(1) Spec. 6M (§ 178.104 of this chapter) metal packaging. Authorized only for solid or gaseous radioactive materials which will not decompose at temperatures up to 250° F. Radioactive thermal decay energy must not exceed 10 watts.

(2) Any other Type B packaging for large quantities of radioactive materials which meets the pertinent requirements in the regulations of the U.S. Atomic Energy Commission (10 CFR Part 71) and is approved by the U.S. Atomic Energy Commission.

(3) Any other Type B packaging which meets the pertinent requirements for large quantities of radioactive materials in the 1967 regulations of the International Atomic Energy Agency, and for which the foreign competent authority certificate has been revalidated by the Department.

§ 173.396 Fissile radioactive material.

(a) The following materials are not classified as fissile radioactive materials, are exempted from this section, and must instead be packaged in accordance with the other provisions of this subpart, as appropriate:

(1) Not more than 15 grams of fissile material;

(2) Thorium, or uranium containing not more than 0.72 percent by weight of fissile material;

(3) Uranium compounds other than metal (e.g., UF_4 , UF_6 , or uranium oxide in bulk form, not pelleted or fabricated into shapes), and aqueous solutions of uranium, in which the total amount of uranium-233 and plutonium present does not exceed 1.0 percent by weight of the uranium-235 content, and the total fissile content does not exceed 1.00 percent by weight of the total uranium content;

(4) Homogenous hydrogenous solutions or mixtures containing not more than:

(i) 500 grams of any fissile material, provided the atomic ratio of hydrogen to fissile material is greater than 7,600; or

(ii) 800 grams of uranium-235, if the atomic ratio of hydrogen to fissile material is greater than 5,200, and the content of other fissile material is not more than 1.0 percent by weight of the total uranium-235 content; or

(iii) 500 grams of uranium-233 and uranium-235, if the atomic ratio of hydrogen to fissile material is greater than 5,200, and the content of plutonium is not more than 1.0 percent by weight of the total uranium-233 and uranium-235 content.

(5) A package containing less than 350 grams of fissile material, if there is not more than 5 grams of fissile material in any cubic foot within the package.

(b) Fissile radioactive materials containing not more than Type A quantities of radionuclides, in either normal form or special form, must be packaged as follows:

(1) Specification 6L (§ 178.103 of this subchapter) metal packaging. See paragraph (c) (1) of this section for authorized contents.

(2) Spec. 6M (§ 178.104 of this subchapter) metal packaging. See paragraph (c) (2) of this section for authorized contents.

(3) Any packaging listed in § 173.395 (a). Authorized only for not more than the following:

(1) 500 grams of uranium-235 as Fissile Class III, or not more than 40 grams of uranium-235 as Fissile Class II. For Fissile Class II shipments, the transport index to be assigned to each package shall be 0.4 for each gram of uranium-235 above 15 grams up to a maximum of 40 grams (transport index of 10).

(ii) 320 grams of plutonium-239 as plutonium-beryllium neutron sources in special form. Total radioactivity content must not exceed 20 curies. The transport index to be assigned to each package shall be 0.5 for each 20 grams, or fraction thereof, of fissile plutonium.

(4) Any other Type A or B packaging for fissile radioactive materials which also meets the pertinent standards for packaging in the regulations of the U.S. Atomic Energy Commission (10 CFR Part 71), and is approved by the U.S. Atomic Energy Commission.

(5) Any other Type A or B packaging for fissile radioactive materials which also meets the pertinent requirements in the 1967 regulations of the International Atomic Energy Agency, and for which the foreign competent authority certificate has been revalidated by the Department.

(6) Specification 20PF-1, 20PF-2, or 20PF-3 (§ 178.120 of this subchapter) or specification 21PF-1 or 2 (§ 178.121 of this subchapter) phenolic-foam insulated protective overpacks, with snug-fitting inner metal cylinders meeting all of the applicable requirements of §§ 173.24, 173.393, and 173.398(b). Handling procedures and packaging criteria must be in accordance with USAEC Report No. ORO-651 or ANSI Standard N-14.1-1971. Quantities of uranium hexafluoride are authorized as follows, with each package to be shipped as fissile Class II, and assigned a minimum transport index as indicated:

Protective overpack specification No.	Maximum inner cylinder diameter		Maximum weight of UF_6 contents		Maximum U^{235} enrichment (w/o)	Fissile class II transport index
	Inches	Centimeter	Pounds	Kilograms		
20PF-1.....	5	12.7	55	25	100	0.1
20PF-2.....	8	20.3	255	116	12.5	.4
20PF-3.....	12	30.5	460	209	5.0	1.1
21PF-1 ¹	30	76	4,950	2,247	5.0	5.0
	30	76	5,020	2,279	5.0	5.0
21PF-2 ¹	30	76	4,950	2,247	5.0	5.0
	30	76	5,020	2,279	5.0	5.0

¹ For 30-in cylinders, the maximum H/U atomic ratio is .088.

² Model 30A inner cylinder (Reference: ORO-651).

³ Model 30B inner cylinder (Reference: ORO-651).

(7) A DOT Specification 6J (§ 178.100 of this subchapter) or 17H (§ 178.118 of this subchapter) 55-gallon steel drum, for transport of not more than 350 grams of uranium-235 in any non-pyrophoric form, enriched to any degree in the U-235 isotope. Each drum must have a minimum 18-gauge body and bottom head and 16-gauge removable top head, with one or more corrugations in the cover near the periphery. Closure must conform to § 178.103-5(a) of this subchapter. At least four 1.2 centimeter (0.5 inch) diameter vent holes must be provided, equally spaced on the sides of the drum near the top, each covered with weatherproof tape, or equivalent device. Appropriate primary inner containment of the contents and any necessary packing material must be provided, such as plastic or metal jars or cans or plastic wrapping, such that Spec. 7A (§ 178.350 of this subchapter) provisions are satisfied. Each inner containment vessel must be capable of venting in the event the package was exposed to the thermal test described in (§ 173.398(c) (2) (iii)). Additionally, liquid contents must be pack-

aged in accordance with § 173.393(g). The maximum weight of contents, including internal packing must not exceed 91 kilograms (200 pounds) with fissile material content limited as follows:

Maximum U ²³⁵ per package (grams)	Minimum transport index per package as fissile class II	Maximum packages per transport vehicle as fissile class III
350	1.8	72
300	1.0	129
250	0.5	256
200	0.3	500
150	0.1	500
100	0.1	500
50	(1)	(1)

¹ Fissile class I.

(8) Any metal cylinder which meets the performance requirements for a specification 7A Type A packaging (see §§ 173.395(a) (1) and 178.350 of this subchapter) for the transport of residual "heels" of enriched solid uranium hexafluoride without a protective overpack, are authorized as Fissile Class I packages, in accordance with the following:

Maximum cylinder diameter		Cylinder volume		Maximum U ²³⁵ enrichment (weight percent)	Maximum "heel" weight per cylinder UF ₆ (U ²³⁵)		
Inches	Centimeter ²	Cubic feet	Liters		Pounds	Kilograms ³	Kilograms
5	12.7	0.311	8.8	100.0	0.1	0.045	0.031
8	20.3	1.359	39	12.5	.5	.227	.019
12	30.5	2.410	68	5.0	1.0	.454	.015
30	76	25.64	725	5.0	25.0	11.35	.383

(c) Fissile radioactive materials containing Type B quantities of radionuclides, in either normal form or special form, must be packaged as follows:

(1) Specification 6L (§ 178.103 of this subchapter) metal packaging. Authorized only for uranium-235, plutonium-239 or 241, as metal, oxide, or compounds which will not decompose at temperatures up to 149°C (300° F.) Radioactive

thermal decay energy output shall not exceed 5 watts. Large quantity radioactive materials in normal form must be packaged in one or more sealed and leak tight metal cans or polyethylene bottles within the Spec. 2R containment vessel.

(i) *Fissile Class II and III packages.* The following quantities of fissile radioactive materials are authorized under the Fissile Class II and III conditions listed:

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Uranium-235 ²		Plutonium ^{2,4}		Fissile class II transport index	Fissile class III maximum number of packages per transport vehicle
H/X ≤ 3	3 < H/X ≤ 20	H/X ≤ 10	10 < H/X ≤ 20		
14.....	³ 3.6	.....	.....	1.3	80
.....	.....	2.5	2.4	1.8	55

¹ Quantity in kilograms.

² All sources of hydrogen within the inner containment vessel must be considered in determining the H/X ratio of inner containment vessel.

³ Volume not to exceed 3.6 liter.

⁴ Plutonium solutions are not authorized.

(2) Spec. 6M (§ 178.104 of this subchapter) metal packaging. Authorized only for solid radioactive materials which will not decompose at temperatures up to 250° F. Radioactive thermal decay energy output shall not exceed 10 watts. Large quantity radioactive materials in normal form must be packaged in one or more sealed and leaktight metal cans or polyethylene bottles within the Spec. 2R containment vessel.

(1) *Fissile Class I packages* The following quantities of fissile radioactive material are authorized for Fissile Class I packages: 1.6 kilograms uranium-235, 0.9 kilograms of plutonium (see Note), 0.5 kilograms of uranium-233. The maximum ratio of hydrogen to fissile material must not exceed three, all sources of hydrogen within the Spec. 2R containment vessel being considered.

NOTE: Because of the 10-watt thermal decay heat limitation, the limit for plutonium 238 is only 0.02 kilograms.

(ii) *Fissile Class II and III packages*

Quantities of fissile radioactive material as shown in the following table are authorized for a Fissile Class II and Fissile Class III package. Where a maximum ratio of hydrogen to fissile material is specified in the table, only the hydrogen interspersed with the fissile material need be considered. For a Fissile Class II package, the minimum transport index to be assigned is shown in the following table. For a Fissile Class III package, the maximum number of similar packages per transport vehicle is shown. Each Fissile Class III shipment is also subject to paragraph (g) of this section. For a uranium-233 shipment, the maximum inside diameter of the inner containment vessel must not exceed 12 centimeters (4.75 inches). Where necessary, a tight fitting steel insert must be used to reduce a larger diameter inner containment vessel specified in § 178.104-3(b) of this subchapter to the 12 centimeters (4.75 inches) limit.

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Uranium-233 ⁵			Uranium-235 ^{4,7}			Plutonium ^{3,4}			Fissile class II transport index	Fissile class III maximum number of packages per transport vehicle
Metal or alloy H/X=0	Compounds		Metal or alloy H/X=0	Compounds		Metal or alloy H/X=0	Compounds			
	H/X=0	H/X ≤ 3		H/X=0	H/X ≤ 3		H/X=0	H/X ≤ 3		
3.6	4.4	2.9	7.2	7.6	5.3	3.1	4.1	3.4	0.1	1,250
^a 4.2	5.2	3.5	8.7	9.6	6.4	3.4	4.5	4.1	.2	625
^a 5.2	6.8	4.5	11.2	13.9	8.3	4.2	-----	4.5	.5	250
-----	-----	-----	13.5	16.0	10.1	4.5	-----	-----	1.0	125
-----	-----	-----	-----	26.0	16.1	-----	-----	-----	5.0	25
-----	-----	-----	-----	32.0	19.5	-----	-----	-----	10.0	12

¹ Quantity in kilograms.

² Minimum percentage of plutonium-240 is 5 weight percent.

³ 4.5 kg limitation of plutonium due to 10 watt decay heat limitation.

⁴ For a mixture of uranium-235 and plutonium an equal amount of uranium-235 may be substituted for any portion of plutonium authorized.

⁵ Maximum inside diameter not to exceed 12 cm (4.75 in) (see par. (c)(2)(ii) of this section).

⁶ Granulated or powdered metal with any particle less than 8 mm (0.25-in) in the smallest dimension is not authorized.

⁷ Maximum uranium-235 enrichment is 93 percent.

(3) Any other Type B packaging which also meets the standards for packaging for fissile radioactive materials in the regulations of the U.S. Atomic Energy Commission (10 CFR Part 71), and is approved by the U.S. Atomic Energy Commission.

(4) Any other Type B packaging which also meets the pertinent requirements for fissile radioactive materials in the 1967 regulations of the International Atomic Energy Agency, and for which the foreign

competent authority certificate has been revalidated by the Department.

(5) Specification 20PF-1 through 3 (§ 178.120 of this subchapter) or Specification 21PF-1 or 2 (§ 178.121 of this subchapter) phenolic-foam insulated protective overpacks. (See paragraph (b)(6) of this section for authorized use.)

(d) [Reserved]

(e) Mixing of packages of other types of radioactive materials, including fis-

tile Class I, with Fissile Class II packages is permitted if the total transport index in any one transport vehicle or storage location does not exceed 50.

(f) For Fissile Class II packages shipped under the exclusive use provisions of § 173.393(j) to provide for packages with high radiation dose rates, the transport index number which is calculated for nuclear criticality control purposes must not exceed 10 for any single package or a total of 50 for the full load, unless specifically authorized by the Department for Fissile Class III shipments

(1) Fissile Class II packages may be shipped with a transport index greater than 10, and combined with other packages of the same or different designs in a Fissile Class III shipment, under the conditions prescribed in paragraph (g) of this section, *Provided*:

(i) The transport index which has been assigned in the package approval for nuclear criticality control purposes does not exceed 10 for any single package;

(ii) The total transport index for nuclear criticality control purposes for all packages in the shipment does not exceed 100;

(iii) The shipment satisfies the provisions of § 173.393(j) if any package has radiation dose rates exceeding 10 millirem per hour at 1 meter (three feet) from any accessible external surface of the package; and

(iv) The shipment will not be transported by water.

(2) Fissile Class III packages, which have been assigned a transport index for nuclear criticality control purposes in accordance with Fissile Class II criteria, may be combined with other Fissile Class III packages of the same or different design for which a transport index has been so assigned for nuclear criticality control purposes, and may be combined with Fissile Class II packages, in a Fissile Class III shipment under the conditions prescribed in paragraph (g) of this section, *Provided*:

(i) The transport index which has been assigned in the package approval for nuclear criticality control purposes does not exceed 50 for any single package;

(ii) The total transport index for nuclear criticality control purposes for all packages in the shipment does not exceed 100;

(iii) The shipment satisfies the provisions of § 173.393(j) if any package has radiation dose rates exceeding 10 millirem per hour at 1 meter (three feet) from any accessible external surface of the package; and

(g) A fissile class III shipment may be made only in accordance with subparagraphs (1), (2), or (3) of this paragraph, or in accordance with other procedures authorized by the Department. The transport controls must provide nuclear criticality safety and must be carried out by the shipper or carrier, as appropriate, to protect against loading, storing, or transporting of that shipment together with any other fissile material.

(1) Transportation in a transport vehicle assigned for the sole use of that consignor, with a specific restriction for such sole use to be provided in the special arrangements, and with instructions to that effect issued with the shipping papers; or

(2) Transportation under escort by person in a separate vehicle, with the escort having the capability, equipment, authority, and instructions to provide administrative controls adequate to assure compliance with this paragraph; or

(3) Transportation in a transport vehicle containing no other packages of radioactive material which are required to bear one of the "Radioactive" labels described in § 173.416. Specific arrangements must be effected between shipper and carrier, with instructions to that effect issued with the shipping papers.

(h) The numerical values for package assignments as fissile class I, the transport indices for fissile class II packages, and the vehicle limitations for fissile class III packages must be determined in accordance with §§ 71.36 through 71.40 of Title 10 of the Code of Federal Regulations.

§ 173.397 Contamination control.

(a) Removable (non-fixed) radioactive contamination is considered significant if the level of contamination, when averaged over any area of 300 square centimeters of any part of the package surface, exceeds any of the following:

Contaminant:	Maximum permissible level	
	uCi, Cm ²	dis/min/ Cm ²
Natural or depleted uranium and natural thorium		
Beta-gamma.....	10 ⁻³	2200
Alpha.....	10 ⁻⁴	220
All other beta-gamma emitting radionuclides.....	10 ⁻⁴	220
All other alpha emitting radionuclides.....	10 ⁻⁵	22

(1) In assessing the surface contamination of a package, a sufficient number of measurements must be taken in the most appropriate locations so as to yield a representative assessment of the contamination situation. The average amount of removable (non-fixed) radioactive contamination may be determined by wiping the external surface of the package with an absorbent material, using moderate pressure, and then measuring the activity on the wiping material. If the measured activity per square centimeter does not exceed 10 percent of the levels prescribed above, it may be assumed that those levels have not been exceeded. Other measurement methods of equal or greater efficiency may also be utilized.

(b) When radioactive materials packages are consigned as exclusive use, as defined in § 173.389(o), removable non-fixed radioactive contamination may not exceed 10 times that as specified in paragraph (a) (1) of this section.

(c) Each transport vehicle used for transporting radioactive materials as exclusive use, as defined in § 173.389(o), must be surveyed with appropriate radiation detection instruments after each use. A vehicle may not be returned to service until the radiation dose rate at any accessible surface is 0.5 millirem per hour or less, and there is no significant removable radioactive surface contamination, as defined in paragraph (a) of this section.

§ 173.398 Special tests.

(a) **Special form material:** To qualify as special form material, the radioactive material must either be in massive solid form or encapsulated. Each item in massive solid form or each capsule must either have no overall dimension less than 0.5 millimeters, or must have at least one dimension greater than 5 millimeters. Each item, or the capsule material, must not dissolve or convert into dispersible form to the extent of more than 0.005 percent, by weight, by immersion for 1 week in water at pH 6-8 and 68° F., and a maximum conductivity of 10 micro-mhos/centimeter, and by immersion in air at 86° F. If in massive solid form, the radioactive material must not break, crumble, or shatter if subjected to the percussion test prescribed in this section, and must not melt, sublime, or ignite at temperatures below 1,000° F. If encapsulated, the capsule must retain its contents when subjected to all of the performance tests prescribed in this section, and must not melt, sublime, or ignite at temperatures below 1,475° F.

(1) **Free drop.** A free drop through a distance of 30 feet on to a flat essentially unyielding horizontal surface, striking the surface in such a position as to suffer maximum damage.

(2) **Percussion.** Impact of the flat circular end of a one inch diameter steel rod weighing three pounds, dropped through a distance of 40 inches. The capsule or material shall be placed on a sheet of lead, of hardness number 3.5 to 4.5 on the Vickers scale, and not more than one inch thick, supported by a smooth, essentially unyielding surface.

(3) **Heating.** Heating in air to a temperature of 1,475° F. and remaining at that temperature for a period of 10 minutes.

(4) **Immersion.** Immersion for 24 hours in water at room temperature. The water shall be at pH6-pH8, with a maximum conductivity of 10 micro-mhos/cm.

NOTE 1: Each shipper of special form radioactive material shall maintain on file for at least one year after the last shipment, and be prepared to provide the Department, a complete certification and supporting safety analysis (see Note 2) demonstrating that the special form material meets the requirements of paragraph (a) of this section.

NOTE 2: Prior to the first shipment of a special form radioactive material outside of the United States, each shipper shall obtain

a. Certificate of Competent Authority for the specific material. Each petition must be submitted in accordance with § 173.393b (b) and (c), and must additionally include the following information:

a. A detailed description of the material, or if a capsule, the contents. Particular reference must be made to both physical and chemical states;

b. A detailed statement of the design of any capsule to be used, including complete engineering drawings and schedules of material, and methods of construction;

c. A statement of the tests which have been done and their results, or evidence based on calculative methods to show that the material is capable of meeting the tests, or other evidence that the special form radioactive material meets the requirements of paragraphs (a) (1) thru (4) of this section.

(b) Standards for Type A packaging:

(1) Type A packaging must be so designed and constructed that, if it were subject to the environmental and test conditions prescribed in this paragraph:

(i) There would be no release of radioactive material from the package;

(ii) The effectiveness of the packaging would not be substantially reduced; and

(iii) There would be no mixture of gases or vapors in the package which could, through any credible increase of pressure or an explosion, significantly reduce the effectiveness of the package.

(2) Environmental conditions:

(i) *Heat.* Direct sunlight at an ambient temperature of 130° F. in still air.

(ii) *Cold.* An ambient temperature of -40° F. in still air and shade.

(iii) *Reduced pressure.* Ambient atmospheric pressure of 0.5 atmosphere (absolute) (7.3 p.s.i.a.).

(iv) *Vibration.* Vibration normally incident to transportation.

(3) Test conditions: The packaging shall be subject to all of the following tests unless specifically exempted therefrom, and also to the consecutive application of at least two of the following tests from which it is not specifically exempted:

(i) *Water spray.* A water spray heavy enough to keep the entire exposed surface of the package except the bottom continuously wet during a period of 30 minutes. Packages for which the outer layer consists entirely of metal, wood, ceramic, or plastic, or combinations thereof, are exempt from the water spray test.

(ii) *Free drop.* Between 1½ to 2½ hours after the conclusion of the water spray test, a free drop through a distance

of 4 feet onto a flat essentially unyielding horizontal surface, striking the surface in a position for which maximum damage is expected.

(iii) *Corner drop.* A free drop onto each corner of the package in succession, or in the case of a cylindrical package onto each quarter of each rim, from a height of 1 foot onto a flat essentially unyielding horizontal surface. This test applies only to packages which are constructed primarily of wood or fiberboard, and do not exceed 110 pounds gross weight, and to all Fissile Class II packagings.

(iv) *Penetration.* Impact of the hemispherical end of a vertical steel cylinder 1¼ inches in diameter and weighing 13 pounds, dropped from a height of 40 inches onto the exposed surface of the package which is expected to be most vulnerable to puncture. The long axis of the cylinder shall be perpendicular to the package surface.

(v) *Compression.* For packages not more than 10,000 pounds in weight, a compressive load equal to either five times the weight of the package or 2 pounds per square inch multiplied by the maximum horizontal cross section of the package, whichever is greater. The load shall be applied during a period of 24 hours, uniformly against the top and bottom of the package in the position in which the package would normally be transported.

(c) Standards for hypothetical accident conditions of transportation for Type B packagings:

(1) Type B packaging must meet the applicable Type A packaging standards and must be designed and constructed and its contents so limited that, if subjected to the hypothetical accident conditions prescribed in this paragraph, it will meet the following conditions:

(i) The reduction of shielding would not be enough to increase the radiation dose rate at three feet from the external surface of the package to more than 1,000 millirem per hour.

(ii) No radioactive material would be released from packages containing Type B quantities of radioactive material. The allowable release of radioactivity from packages containing large quantities of radioactive material is limited to gases and contaminated coolant containing total radioactivity exceeding neither 0.1 percent of the total radioactivity of the package contents nor 0.01 curie of Group

I radionuclides, 0.5 curie of Group II radionuclides, and 10 curies of Groups III and IV radionuclides, except that for inert gases the limit is 1,000 curies.

(2) Test conditions: The conditions which the package must be capable of withstanding must be applied sequentially, to determine their cumulative effect on a package, in the following order:

(i) *Free drop* A free drop through a distance of 30 feet onto a flat essentially unyielding horizontal target surface, striking the surface in a position for which maximum damage is expected.

(ii) *Puncture*. A free drop through a distance of 40 inches striking, in a position for which maximum damage is expected, the top end of a vertical cylindrical mild steel bar mounted on an essentially unyielding horizontal surface. The bar shall be 6 inches in diameter, with the top horizontal and its edge rounded to a radius of not more than one-fourth inch, and of such a length as to cause maximum damage to the package, but not less than 8 inches long. The long axis of the bar shall be perpendicular to the unyielding horizontal surface.

(iii) *Thermal*. Exposure to a thermal test in which the heat input to the package is no less than that which would result from exposure of the whole package to a radiation environment of 1,475° F. for 30 minutes with an emissivity coefficient of 0.9, assuming the surfaces of the package have an absorption coefficient of 0.8. The package shall not be cooled artificially until 3 hours after the test period unless it can be shown that the temperature on the inside of the package has begun to fall in less than 3 hours.

(iv) *Water immersion (fissile radioactive materials packages only)*. Immersion in water to the extent that all portions of the package to be tested are under at least 3 feet of water for a period of not less than 8 hours.

(d) It is not necessary to actually conduct the tests prescribed in this section if it can be clearly shown, through engineering evaluations or comparative data, that the material or item would be capable of performing satisfactorily under the prescribed test conditions.

§ 173.399 [Reserved]

Subpart I — [Reserved]

Subpart J—Other Regulated Material; Definition and Preparation

§ 173.500 Definitions.

(a) For the purpose of this subchapter, an Other Regulated Material (ORM) A, B, or C is any material that does not meet the definition of a hazardous material, other than a combustible liquid in packagings having a capacity of 110 gallons or less, and is specified in § 172.101 as an ORM material or that possesses one or more of the characteristics described in the following groups.

NOTE 1: An ORM with a flash point of 100° to 200° F. when transported with more than 110 gallons in one container shall be classed as a combustible liquid.

(1) An ORM-A material is a material which has an anesthetic, irritating, noxious, toxic, or other similar property and which can cause extreme annoyance or discomfort to passengers and crew in the event of leakage during transportation.

(2) An ORM-B material is a material (including a solid when wet with water) capable of causing significant damage to a transport vehicle or vessel from leakage during transportation. Materials meeting one or both of the following criteria are ORM-B materials:

(i) A liquid substance that has a corrosion rate exceeding 0.250 inch per year (IPY) on aluminum (nonclad 7075-T6) at a test temperature of 130° F. An acceptable test is described in NACE Standard TM-01-69.

(ii) Specifically designated by name in § 172.101 of this subchapter.

(3) An ORM-C material is a material which has other inherent characteristics not described as an ORM-A or ORM-B but which make it unsuitable for shipment, unless properly identified and prepared for transportation. Each ORM-C material is specifically named in § 172.101 of this subchapter.

(4) An ORM-D material is a material such as a consumer commodity which, though otherwise subject to the regulations of this subchapter, presents a limited hazard during transportation due to its form, quantity and packaging. They must be materials for which exceptions are provided in § 172.101 of this subchapter. A shipping description applicable to each ORM-D material or category of ORM-D materials is found in § 172.101 of this subchapter.

§ 173.505 [Reserved]

§ 173.510 [Reserved]

Subpart K — [Reserved]

Subpart L — [Reserved]

Subpart M — [Reserved]

Subpart N—Other Regulated Material;
ORM-D

§ 173.1200 Consumer Commodity.

(a) In order to be transported under the proper shipping name of "Consumer commodity," a material must meet that definition. It may be reclassified and offered for shipment as ORM-D material (see § 173.500) provided that an ORM-D exception is authorized in specific sections applicable to the material, and that it is prepared in accordance with the following paragraphs. (The gross weight of each package must not exceed 65 pounds.)

(1) *Flammable Liquids must be:* (i) In inside metal containers, each having a rated capacity of 1 quart or less, packed in strong outside packagings;

(ii) In inside containers, each having a rated capacity of 1 pint or less, packed in strong outside packagings.

(iii) In inside containers, each having a rated capacity of one gallon or less, packed in strong outside packagings. The provisions of this exception apply only if the flash point of the material is 73° F. or higher.

(2) *Corrosive liquids must be:* (i) In bottles, each having a rated capacity of 1 pint or less, each enclosed in a metal can, packed in strong outside packagings.

(ii) In metal or plastic containers, each having a rated capacity of 1 pint or less, packed in strong outside packagings.

(iii) In metal or plastic inside containers, each having a rated capacity of not over 1 quart, packed in strong outside packaging provided the liquid mixture contains 15 percent or less corrosive material and the remainder of the mixture does not meet the definition of a hazardous material as defined in this subchapter.

(3) *Corrosive solids must be:* (i) In earthenware, glass, plastic or paper containers each having a net weight of 5 pounds or less, packed in strong metal, wooden, or fiberboard outside packagings, each having a net weight of 25 pounds or less.

(ii) In metal, rigid fiber, or composition cans or cartons or rigid plastic containers each having a net weight of 10 pounds or less, packed in strong outside packagings each having a net weight of 25 pounds or less.

(iii) In metal, rigid fiber, or composition cans or cartons or rigid plastic containers, each having a rated capacity of not over 20 pounds, overpacked in metal, wooden or fiberboard outside containers not exceeding 50 pounds net weight provided the solid mixture contains 10 percent or less corrosive material and the remainder of the mixture does not meet the definition of a hazardous material as defined in this subchapter.

(4) *Flammable solids* except for charcoal briquettes must be in inside containers each having a net weight of 1 pound or less, packed in strong outside packagings each having a net weight of 25 pounds or less. Charcoal briquettes may be shipped in packagings having a net weight of 65 pounds or less.

(5) *Oxidizers* must be in inside containers each having a rated capacity of 1 pint or less for liquids or a net weight of 1 pound or less for solids, packed in strong outside packaging each having a net weight of 25 pounds or less.

(6) *Organic peroxides* must be: (i) In inside containers which must be securely packed and cushioned with noncombustible cushioning material in strong outside packagings containing not over 1 pint or 1 pound net quantity of the materials. Cushioning is not required when the liquid is contained in strong, securely closed, plastic packagings, not over 1 ounce capacity each, properly packed to prevent leakage or breakage.

(ii) In strong outside packagings of 24 or less inside fiberboard containers, each having 70 or less securely closed tubes having a maximum fluid capacity of 1/8-ounce each and securely packed in noncombustible cushioning material. Each fiberboard container may not contain more than 1 pint of liquid.

(7) *Poison B liquids or solids* must be in inside containers, each having a rated capacity of 8 ounces or less by volume for liquids or of 8-ounces or less net weight for solids packed in strong out-

side packagings.

(8) *Compressed gases* must be: (i) In inside containers, each having a water capacity of 4-fluid ounces or less (7.22 cubic inches or less), packed in strong outside packagings.

(ii) In inside metal container charged with a solution of materials and compressed gas or gases which is nonpoisonous, meeting all of the following:

(A) Capacity may not exceed 50 cubic inches (27.7 fluid ounces);

(B) Pressure in the container may not exceed 180 p.s.i.g. at 130° F. (55° C.). If the pressure exceeds 140 p.s.i.g. at 130° F., (55° C.) but does not exceed 160 p.s.i.g. at 130° F., (55° C.) a specification DOT 2P (§ 178.33 of this subchapter) inside metal container must be used; if the pressure exceeds 160 p.s.i.g. at 130° F., (55° C.), a specification DOT 2Q (§ 178.33a of this subchapter) inside metal container must be used. In any event the metal container must be capable of withstanding, without bursting, a pressure of one and one-half times the equilibrium pressure of the contents at 130° F. (55° C.);

(C) Liquid content of the material and gas not completely fill the container at 130° F. (55° C.);

(D) The containers must be packed in strong outside packagings; and

(E) Each completed container filled for shipment must have been heated until the pressure in the container is equivalent to the equilibrium pressure of the content at 130° F. (55° C.) without evidence of leakage, distortion, or other defect.

(iii) In a non-refillable inside metal container of 50 cubic-inch capacity or less (27.7 fluid ounces), with foodstuffs or soaps and with soluble or emulsified compressed gas, provided the pressure in the container does not exceed 140 p.s.i.g. at 130° F. (55° C.). The metal container must be capable of withstanding, without bursting, a pressure of one and one-half times the equilibrium pressure of the contents at 130° F. (55° C.) and must comply with the following provisions:

(A) Containers must be packed in strong outside packagings, and

(B) Liquid content of the material and gas may not completely fill the container at 130° F. (55° C.).

(iv) In refillable inside metal containers with cream and soluble or emulsified compressed gas packed in strong outside

packagings. Containers must be of such design that they will hold pressure without permanent deformation up to 375 p.s.i.g. and must be equipped with a device designed so as to release pressure without bursting of the container or dangerous projection of its parts at higher pressures.

(v) In non-refillable inside metal containers charged with a solution, containing biological products or a medical preparation which could be deteriorated by heat, and compressed gas or gasses which is nonpoisonous and nonflammable. The capacity of each container may not exceed 35 cubic inches (19.3 fluid ounces). The pressure in the container may not exceed 140 p.s.i.g. at 130° F. (55° C.), and the liquid content of the product and gas may not completely fill the container at 130° F. (55° C.). One completed container out of each lot of 500 or less, filled for shipment, must be heated, until the pressure in the container is equivalent to the equilibrium pressure of the content at 130° F. (55° C.). There may not be no evidence of leakage, distortion, or other defect. Container must be packed in strong outside packagings. .

(vi) In electronic tubes, each having a volume of not more than 30 cubic inches and charged with gas to a pressure of not more than 35 p.s.i.g. and packed in strong outside packagings.

(vii) In an inside metal container as a component of an audible fire alarm system powered by a compressed gas meeting the following provisions:

(A) Each inside container must have contents which are not flammable, poisonous, or corrosive as defined under this Part;

(B) Each inside container may not have a capacity exceeding 35 cubic inches (19.3 fluid ounces);

(C) Each inside container may not have a pressure exceeding 70 p.s.i.g. at 70° F. (21° C.) and the liquid portion of the gas may not completely fill the inside container at 130° F. (55° C.);

(D) Each inside container must be designed and fabricated with a burst pressure of not less than five times its charged pressure or more at 130° F. (55° C.); and

(E) Each fire alarm system must be packed in a strong outside packaging.

APPENDIX A—METHOD OF TESTING CORROSION TO SKIN

1. Corrosion to the skin is measured by patch-test technique on the intact skin of the albino rabbit, clipped free of hair. A minimum of six subjects are to be used in this test.

2. Introduce under a square cloth patch, such as surgical gauze measuring not less than 1 inch by 1 inch and two single layers thick, 0.5 milliliter (in the case of liquids) or 0.5 gram (in the case of solids and semi-solids) of the substance to be tested.

3. Immobilize the animals with patches secured in place by adhesive tape.

4. Wrap the entire trunk of each animal with an impervious material, such as rubberized cloth, for the 4 hour period of exposure. This material is to aid in maintaining the test patches in position and retards the evaporation of volatile substances. It is not applied for the purpose of occlusion.

5. After 4 hours of exposure, the patches are to be removed and the resulting reactions are to be evaluated for corrosion.

6. Following this initial reading, all test sites are washed with an appropriate solvent to prevent further exposure.

7. Readings are again to be made at least at the end of a total of 48 hours (44 hours after the first reading).

8. Corrosion will be considered to have resulted if the substance in contact with the rabbit skin has caused destruction or irreversible alteration of the tissue. Tissue destruction is considered to have occurred if, at any of the readings, there is ulceration or necrosis. Tissue destruction does not include merely sloughing of the epidermis, or erythema, edema, or fissuring.

PART 174 [Reserved]

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PART 177—CARRIAGE BY PUBLIC HIGHWAY

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Subpart A—General Information and Regulations

§ 177.800 Purpose of regulations in this subchapter.

(a) To promote the uniform enforcement of law and to minimize the dangers to life and property incident to the transportation of hazardous materials, by private, common and contract carriers, by motor vehicle, the regulations in this subchapter are prescribed to define these articles for motor vehicle transportation purposes, and to state the precautions that must be observed by the carrier in handling them while in transit. It is the duty of each such carrier to make the prescribed regulations effective and to thoroughly instruct employees in relation thereto.

§ 177.801 Scope of regulations in this subchapter.

(a) Hazardous materials except such as may not be accepted and transported under this subchapter, may be accepted and transported by private, common and contract carriers by motor vehicle provided they are in proper condition for transportation and are certified as being in compliance with this subchapter, and provided the method of manufacture, packing, and storage, so far as they affect safety in transportation, are open to inspection by a duly authorized representative of the initial carrier. Shipments of hazardous materials not in proper condition for transportation, or loaded or stayed as required, or certified as to proper packing, marking and description as required in this subchapter, must not be accepted for transportation or transported.

§ 177.802 [Reserved]

§ 177.803 Export and import shipments by domestic carriers by motor vehicles.

See § 171.12 of this subchapter.

§ 177.804 [Reserved]

§ 177.805 Canadian shipments and packagings.

(a) Canadian shipments and packagings may be carried under conditions specified in § 173.8 of this subchapter.

§ 177.806 U.S. Government material.

(a) Shipments of hazardous materials offered by or consigned to the Department of Defense (DOD) of the U.S. Government must be packaged, including limitations of weight, in accordance with the regulations in this subchapter or in containers of equal or greater strength and efficiency as required by DOD regulations.

(1) Hazardous materials sold by the DOD in packagings that are not marked in accordance with the requirements of this subchapter may be shipped from DOD installations if the DOD certifies in writing that the packagings are equal to or greater in strength and efficiency than the packaging prescribed in this subchapter. The shipper shall obtain such a certification in duplicate for each shipment. He shall give one copy to the originating carrier and retain the other for no less than 1 year.

(b) Shipments of radioactive materials, made by or under the direction of supervision of the U.S. Atomic Energy Commission or the Department of Defense, and which are escorted by personnel specially designated by or under the authority of those agencies, for the purpose of national security, are exempt from the regulations in this subchapter.

§ 177.807 Reporting hazardous materials incidents.

Each carrier shall report incidents involving hazardous materials as required by § 171.15 of this chapter.

§ 177.808 Connecting carrier shipments.

Shipments of hazardous materials offered by connecting transportation lines must comply with this subchapter.

§ 177.809 Carrier's material and supplies.

The regulations in this subchapter ap-

ply to all shipments of hazardous materials, including carrier's material and supplies.

§ 177.810 Vehicular tunnels.

Nothing contained in this subchapter shall be so construed as to nullify or supersede regulations established and published under authority of State statute or municipal ordinance regarding the kind, character, or quantity of any hazardous material permitted by such regulations to be transported through any urban vehicular tunnel used for mass transportation.

§ 177.811 Astray shipments.

(a) Any carrier in possession of an astray shipment of hazardous materials (other than explosives) shall forward it promptly to its destination, if known, after inspection has shown the package to be in proper condition for transportation.

(b) If the package of hazardous materials is not labeled and the exact classification of the contents is not determinable, the carrier shall apply a **FLAMMABLE LIQUID** label.

§ 177.812 Containers required.

Containers required for hazardous materials are prescribed in Part 173 of this subchapter, Regulations Applying to Shippers.

§ 177.813 [Reserved]

§ 177.814 Retention of manufacturer's certificate and retest reports.

(a) Each motor carrier who uses a cargo tank vehicle shall have in his files a certificate or manufacturer's data report signed by a responsible official of the manufacturer or fabricator of the cargo tank, or a competent testing agency, certifying that the cargo tank identified in the certificate was manufactured and tested in accordance with the requirements contained in the specification under which the cargo tank was constructed. The certificate and any other data furnished as required by the specification must be retained at the principal office of the carrier during the time that the cargo tank is used by the carrier and for one year thereafter.

(1) Except for specifications MC 330 and MC 331 cargo tanks, a motor carrier

may himself perform the tests and inspections to determine whether the tank meets the requirements of the specification. If the motor carrier performs the tests and inspections and determines that the tank conforms to the specification, he may use the tank if he retains the test data, in place of a certificate, in his files at his principal office for as long as he uses the tank and one year thereafter.

(2) A motor carrier using a specification MC 330 cargo tank for which such carrier is unable to obtain the manufacturer's data report required by the specification may copy the information contained on the cargo tank's identification plate and ASME Code plate and retain such information as required by this section.

(3) Each motor carrier who uses a specification cargo tank which he does not own and has not tested or inspected shall obtain a copy of the manufacturer's certificate or manufacturer's data report and retain it in his files at his principal office during the time he uses the tank and for one year thereafter. A motor carrier using a specification MC 330 cargo tank which he does not own may copy the information contained on the cargo tank's identification plate and ASME Code plate if the manufacturer's data report is not available from the owner of the tank.

(b) A motor carrier may retain the certificate and other data specified in paragraph(a) of this section at a regional or terminal office.

(c) *Withdrawal of certification.* See § 177.824(i) of this subchapter.

(d) A copy of retest and inspection reports required by §§ 173.33 and 177.824 of this subchapter and all records of repairs to each cargo tank vessel must be retained in the same file with the manufacturer's certificate or manufacturer's data report for that tank as specified in paragraph (a) of this section. This provision does not apply to a motor carrier leasing a cargo tank for less than 30 days if the lessor has the records required by this section in his files.

§ 177.815 Lost or destroyed labels.

Each carrier shall maintain an adequate supply of the labels specified in Subpart E of Part 172 of this subchapter

to replace those that become lost or destroyed. The carrier shall replace each lost or destroyed label based on the information on the shipping papers.

§ 177.816 [Reserved]

§ 177.817 Shipping papers.

(a) *General requirements.* A carrier may not transport a hazardous material unless it is accompanied by a shipping paper that is prepared in accordance with §§ 172.201, 172.202, 172.203, and 172.205 of this subchapter.

(b) *Shipper certification.* An initial carrier may not accept hazardous material offered for transportation unless the shipping paper describing the material includes a shipper's certification which meets the requirements in § 172.204 of this subchapter. The certification is not required for shipments to be transported entirely by private carriage and for bulk shipments to be transported in a cargo tank supplied by the carrier.

(c) *Requirements when interlining with carriers by rail.* A motor carrier shall mark on the shipping paper required by this section, if it offers or delivers a freight container or transport vehicle to a rail carrier for further transportation:

- (1) A description of the freight container or transport vehicle; and
- (2) The kind of placard affixed to the freight container or transport vehicle.

(d) This section does not apply to materials classed as an ORM-A, B, C, or D.

(e) *Shipping paper accessibility—accident or inspection.* A driver of a motor vehicle containing hazardous material, and each carrier using such a vehicle, shall ensure that the shipping paper required by this section is readily available to, and recognizable by, authorities in the event of accident or inspection. Specifically, the driver and the carrier shall—

- (1) Clearly distinguish the shipping paper, if it is carried with other shipping papers or other papers of any kind, by either distinctively tabbing it or by having it appear first; and
- (2) Store the shipping paper as follows:

(i) When the driver is at the vehicle's controls, the shipping paper shall be:

(A) Within his immediate reach while he is restrained by the lap belt; and (B) either readily visible to a person entering the driver's compartment or in a holder which is mounted to the inside of the door on the driver's side of the vehicle.

(ii) When the driver is not at the vehicle's controls, the shipping paper shall be: (A) In a holder which is mounted to the inside of the door on the driver's side of the vehicle; or (B) on the driver's seat in the vehicle.

§ 177.821 Hazardous materials forbidden or limited for transportation.

(a) *Nitroglycerin, desensitized liquid nitroglycerin or diethylene glycol dinitrate forbidden to common carriers.* Liquid nitroglycerin, desensitized liquid nitroglycerin or diethylene glycol dinitrate, except as defined in § 173.53(e) of this chapter, may not be accepted for transportation or be transported by any common carrier by motor vehicle.

(b) *Rejection of leaking containers of liquid nitroglycerin, desensitized liquid nitroglycerin or diethylene glycol dinitrate.* Any individual container used for the transportation of liquid nitroglycerin, desensitized liquid nitroglycerin or diethylene glycol dinitrate, or any boot used therewith, found in such a condition as to permit leakage, shall be discarded and shall not thereafter be repaired for further use.

(c) *Hazardous materials forbidden or limited for transportation.* No motor carrier may accept for transportation or transport any hazardous material listed in Commodity List (§ 172.101 of this chapter), as "forbidden" for transportation by all motor carriers; nor, if there be any prohibition or limitation regarding the transportation of any particular hazardous material by a particular kind of motor carrier, may any such article be accepted for transportation or be transported by that kind of carrier, except as indicated in this part. (See § 177.870.)

(d) *Leaking or damaged packages of high explosive must not be accepted for transportation or transported.* Should any package of high explosive when offered for shipment show excessive dampness or be moldy or show outward signs of any

oily stain or other indication that absorption of the liquid part of the explosive is not perfect, or that the amount of the liquid part is greater than the absorbent can carry, the package must be refused in every instance. The shipper must substantiate any claim that a stain is due to contact with material other than the liquid explosive ingredient of the explosive. In case of doubt the package must be rejected.

(e) Condemned or leaking dynamite, repacking. Condemned or leaking dynamite must not be repacked and offered for shipment unless the repacking is done by a competent person in the presence of or with the written consent of a representative of the Department.

(f) Smokeless powder for small arms in quantities not exceeding 100 pounds net weight transported in a motor vehicle may be classed as a flammable solid when approved for this classification by the Bureau of Explosives. Maximum quantity in any inside packaging must not exceed 8 pounds and inside packagings must be arranged and protected to prevent simultaneous ignition of the contents. The complete package must be a type approved by the Bureau of Explosives. Each outside package must bear a flammable solid label.

§ 177.822 Acceptable articles.

(a) Any motor carrier may accept for transportation or transport any acceptable hazardous materials listed in the Commodity List, § 172.101 of this subchapter: Provided, however, that no provision of this section shall be so construed as to permit the acceptance or transportation of liquid nitroglycerin, desensitized liquid nitroglycerin or diethylene glycol dinitrate, other than as defined in § 173.53(e) of this subchapter, by any common carrier.

(b) *Liquid nitroglycerin, desensitized liquid nitroglycerin or diethylene glycol dinitrate.* Liquid nitroglycerin, desensitized liquid nitroglycerin or diethylene glycol dinitrate, other than as defined in § 173.53(e) of this subchapter, may be transported only by motor carriers other than common carriers in containers complying with specification MC200 (§ 178.315 of this subchapter). No form of trailer may be attached.

§ 177.823 Marking and placarding motor vehicles.

(a) A carrier may not move a transport vehicle containing a hazardous material unless the vehicle is marked and placarded in accordance with Part 172 of this subchapter, or unless, in an emergency —

(1) The vehicle is escorted by a representative of a state or local government;

(2) The carrier has permission from the Department; or—

(3) Movement of the transport vehicle is necessary to protect life or property.

§ 177.824 Retesting and inspection of cargo tanks.

(a) *General.* In accordance with § 173.33 of this subchapter (cargo tank use authorization) every cargo tank and every compartment of a cargo tank authorized as a qualified container, except those cargo tanks having a capacity of 3,000 gallons or less used exclusively for the transportation of flammable liquids, must fulfill the applicable requirements as set forth in this section.

(1) Each cargo tank, except specifications MC 330 and MC 331 cargo tanks, must be in compliance with the testing requirements prescribed in paragraphs (a), (b), (c), and (d) of this section. Each cargo tank must be in accordance with the marking requirement of paragraph (h) of this section.

(2) Every cargo tank whether constructed in accordance with DOT specifications or being operated as a novel tank under special permit authorization shall not continue in service unless it has successfully fulfilled the testing requirements as set forth in this section.

(b) Visual inspection requirements. Every cargo tank shall receive an external visual inspection at least once in every 2-year period. The first such inspection shall be required at the time the next hydrostatic retest is due. This inspection shall be made by a responsible and experienced inspector who shall record the condition of the items set forth below. The inspection record shall be approved and signed by an authorized representative of the owner or operator. A written report of each inspection shall be retained in carrier's or owner's files for a period of 2 years after the date of inspection. Where insulation precludes external visual inspection, the cargo tank shall receive a

visual internal inspection for corroded areas, defects in welds or tank sheets. Where visual inspection is precluded by both internal coating and external insulation or when the cargo tank is not equipped with a manhole, the tank shall be hydrostatically tested at 5-year intervals except as otherwise provided in paragraph (c) of this section. The tank shall not be placed in or returned to service if evidence of any unsafe condition is discovered and until such condition has been corrected. Inspection shall consist of the following items:

(1) The tank shall be inspected for: Corroded areas, bad dents, and defects in welds; defects in piping, valves, and gaskets; and other conditions, including leakage, which indicate weakness in the tank that might render it unsafe for transportation service.

(2) Devices for tightening manhole covers must be operative and leakage at manhole covers and gaskets must be corrected.

(3) Spring-loaded safety-relief valves rated in excess of 7 p.s.i.g. shall be removed from the cargo tank and tested.

(4) All emergency devices and valves must be free from corrosion, distortion, and any damage which will prevent their normal operation.

(5) Missing or loose bolts or nuts on any flanged connection or blank flange must be replaced or tightened.

(6) Required markings on the tank shall be legible.

(7) The entire vehicle shall be inspected for and comply with the Illinois Vehicle Code.

(c) *Hydrostatic or pneumatic testing requirements.* In addition to the visual inspection requirements as contained in paragraph (b) of this section, hydrostatic or pneumatic testing of cargo tanks (or compartments) is required to be conducted in accordance with the provisions contained in paragraph (d) of this section to qualify as an authorized container if:

(1) The cargo tank has been out of service (transporting hazardous materials) 1 year or more, or

(2) The cargo tank has been involved in an accident in which it may have been dented, torn, or otherwise damaged so as to affect its product retention integrity, or

(3) The shell of the cargo tank as originally manufactured has been modified, or

(4) The cargo tank is operating under exemption authorization. Such tanks shall be hydrostatically tested once every calendar year unless otherwise provided for in the exemption, and shall successfully fulfill the requirements set forth in paragraph (d) of this section. No two such required tests shall be closer than 6 months.

(d) *Hydrostatic or pneumatic testing procedure.* The requalification as an authorized container of cargo tanks (or compartments) required to be hydrostatically or pneumatically tested in accordance with paragraph (a) of this section shall be based on successfully meeting the requirements of this paragraph.

(1) *General.* (i) If a cargo tank is compartmented each compartment shall be similarly tested with the adjacent compartment empty and at atmospheric pressure.

(ii) All closures shall be in place while the test is being made. During the test all relief devices shall be clamped, plugged or otherwise rendered inoperative. Relief devices shall be returned to their operative condition immediately after the tests are completed.

(iii) The tank or compartment must hold the prescribed pressure for at least 10 minutes. All tank valves, piping, and other accessories in communication with the lading must be pressure tested and proven tight at the tank design pressure.

(iv) All pressure bearing portions of the heating system of a cargo tank (or compartment) employing such media as steam or hot water for heating the lading shall be tested under hydrostatic pressure and proven to be tight at 14.06 kg./sq. cm (200 psig). Systems employing flues for heating the lading shall be suitably tested to insure against product leakage into the flues or into the atmosphere.

(2) *Hydrostatic test.* For Hydrostatic testing, the tank (including its domes, if any) must be completely filled with water or a liquid having a viscosity similar to water. Pressure must be gauged at the top of the tank applied in accordance with Table I following paragraph (d)(3) of this section.

(3) *Pneumatic test.* Pneumatic pressure must be applied in accordance with

Table I of this paragraph. During the pneumatic test the entire surface of all joints under pressure must be coated with a solution of soap and water, heavy oil, or other materials suitable for the purpose of foaming or bubbling to indicate the presence of leaks. Other methods equally sensitive for determining leaks may be used.

TABLE I

Container type:	Test pressure KG/SQ. CM.
MC 300, 301, 302, 303, 305, 306 -----	0.2109 (3 psig)
MC 304, 307 -----	1.76 ¹ (25 ¹ psig)
MC 310, 311, 312 -----	0.2109 ¹ (3 ¹ psig)

¹ Or 1½ times design pressure whichever is greater.

(4) **Required results.** A cargo tank (or compartment) required to be hydrostatically or pneumatically tested in accordance with paragraph (a) of this section may not be returned to service as a specification cargo tank unless it has successfully retained the applicable test pressure (see Table I in paragraph (d) (3) of this section) without leakage, undue distortion, excessive permanent expansion, or evidence of impending failure. The suitability of any repairs shall be determined by the same method of test.

(i) Cargo tanks (or compartments) with heating systems shall successfully withstand the hydrostatic pressure and examination specified in paragraph (d) (1) (iv) of this section.

(e) **Compressed gas cargo tanks, specifications MC 330 and MC 331.** Each cargo tank constructed in compliance with specification MC 330 or MC 331 (§ 178.337 of this subchapter) must be inspected and tested in accordance with § 173.33 of this subchapter.

(f) **Reporting requirements.** Each motor carrier shall file with the Director, Bureau of Motor Carrier Safety, Federal Highway Administration, U.S. Department of Transportation, Washington, D.C. 20590, a written listing of all MC 330 and MC 331 cargo tanks he has in service. Each motor carrier, upon placing in service or withdrawing from service any MC 330 and MC 331 cargo tank (other than a cargo tank used in interchange service which is reported upon by another carrier), shall file a supplemental report with the Bureau.

(1) The initial listing and each subsequent report must include the following information:

(i) The carrier's name, address, and telephone number.

(ii) One of the following statements: "Cargo tank placed in service" or "Cargo tank withdrawn from service," as appropriate, followed by the date of placement or removal;

(iii) The carrier's equipment number, manufacturer's name, manufacturer's serial number, specification MC 330 or MC 331, and "QT" (quenched and tempered) or "NQT" (not quenched and tempered).

(2) A copy of each report required by this paragraph must be retained by the carrier during the period the tank is in the carrier's service and for 1 year thereafter.

(g) **Special testing required by the Department.** Upon the showing of probable cause of the necessity for retest, the Department may require any cargo tank to be retested at any time in accordance with the requirements prescribed for its periodic retest.

(h) **Test date markings.** The month and year of the last test must be durably and legibly marked on the tank in letters not less than 1¼ inches high, on the right side near the front. These markings must be near the metal certification plate, except on any tank having the plate other than on the right side near the front.

(i) **Withdrawal of certification.** If, as the result of an accident or for any other reason a cargo tank no longer meets the applicable specification, the carrier shall remove the metal certification plate or make it illegible (see § 173.24(c) (1) (v) of this subchapter). The details of the conditions necessitating withdrawal of the certification must be recorded and signed on the written certificate for that cargo tank. The vehicle owner shall retain the certificate for at least 1 year after withdrawal of the certification.

Subpart B—Loading and Unloading

NOTE: For prohibited loading and storage of hazardous materials, see § 177.848.

§ 177.834 General requirements.

(a) **Packages secured in a vehicle.** Any tank, barrel, drum, cylinder, or other packaging, not permanently attached to a motor vehicle, which contains any flammable liquid, compressed gas, corrosive material, poisonous material, or

radioactive material must be secured against movement within the vehicle on which it is being transported, under conditions normally incident to transportation.

(b) *No hazardous materials on pole trailers.* No hazardous materials may be loaded into or on or transported in or on any pole trailer.

(c) *No smoking while loading or unloading.* Smoking on or about any motor vehicle while loading or unloading any explosive, flammable liquid, flammable solid, oxidizing material, or flammable compressed gas is forbidden.

(d) *Keep fire away, loading and unloading.* Extreme care shall be taken in the loading or unloading of any explosive, flammable liquid, flammable solid, oxidizing material, or flammable compressed gas into or from any motor vehicle to keep fire away and to prevent persons in the vicinity from smoking, lighting matches, or carrying any flame or lighted cigar, pipe, or cigarette.

(e) *Handbrake set while loading and unloading.* No hazardous material shall be loaded into or on, or unloaded from, any motor vehicle unless the handbrake be securely set and all other reasonable precautions be taken to prevent motion of the motor vehicle during such loading or unloading process.

(f) *Use of tools, loading and unloading.* No tools which are likely to damage the effectiveness of the closure of any package or other container, or likely adversely to affect such package or container, shall be used for the loading or unloading of any explosive or other dangerous article.

(g) *Prevent relative motion between containers.* Containers of explosives, flammable liquids, flammable solids, oxidizing materials, corrosive materials, compressed gases, and poisonous liquids or gases, must be so braced as to prevent motion thereof relative to the vehicle while in transit. Containers having valves or other fittings must be so loaded that there will be the minimum likelihood of damage thereto during transportation.

(h) *Precautions concerning containers in transit; fueling road units.* Reasonable care should be taken to prevent undue rise in temperature of containers and their contents during transit. There must be no tampering with such container or the contents thereof nor any discharge of the contents of any con-

tainer between point of origin and point of billed destination. Discharge of contents of any container, other than a cargo tank, must not be made prior to removal from the motor vehicle. Nothing contained in this paragraph shall be so construed as to prohibit the fueling of machinery or vehicles used in road construction or maintenance.

(i) *Attendance requirements.* (1) *Loading.* A cargo tank must be attended by a qualified person at all times when it is being loaded. The person who is responsible for loading the cargo tank is also responsible for ensuring that it is so attended.

(2) *Unloading.* A motor carrier who transports hazardous materials by a cargo tank must ensure that the cargo tank is attended by a qualified person at all times during unloading. However, the carrier's obligation to ensure attendance during unloading ceases when—

(i) The carrier's obligation for transporting the materials is fulfilled;

(ii) The cargo tank has been placed upon the consignee's premises; and

(iii) The motive power has been removed from the cargo tank and removed from the premises.

(3) A person "attends" the loading or unloading of a cargo tank if, throughout the process, he is awake, has an unobstructed view of the cargo tank, and is within 7.62 meters (25 feet) of the cargo tank.

(4) A person is "qualified" if he has been made aware of the nature of the hazardous material which is to be loaded or unloaded, he has been instructed on the procedures to be followed in emergencies, he is authorized to move the cargo tank, and he has the means to do so.

(5) A delivery hose, when attached to the cargo tank, is considered a part of the vehicle.

(j) *Prohibited loading combinations.* In any single driven motor vehicle or in any single unit of a combination of motor vehicles, hazardous materials shall not be loaded together if prohibited by loading and storage chart, § 177.848. This section shall not be so construed as to forbid the carrying of materials essential to safe operation of motor vehicles.

(k) *Access to mixed loadings.* Flammable solids, oxidizing materials, or corrosive liquids, when transported on a

motor vehicle with other lading not otherwise forbidden, shall be so loaded as to provide ready access thereto for shifting or removal.

(1) *Use of cargo heaters when transporting certain hazardous material.* Transportation includes loading, carrying, and unloading.

(1) *When transporting explosives.* A motor vehicle equipped with a cargo heater of any type may transport explosives only if the cargo heater is rendered inoperable by: (i) Draining or removing the cargo heater fuel tank; and (ii) disconnecting the heater's power source.

(2) *When transporting certain flammable material—(i) Use of combustion cargo heaters.* A motor vehicle equipped with a combustion cargo heater may be used to transport flammable liquid or flammable gas only if each of the following requirements are met—

(A) It is a catalytic heater.

(B) The heater's surface temperature cannot exceed 130° F. (54° C.)—either on a thermostatically controlled heater or on a heater without thermostatic control when the outside or ambient temperature is 60° F. (15.6° C.) or less.

(C) The heater is not ignited in a loaded vehicle.

(D) There is no flame, either on the catalyst or anywhere in the heater.

(E) The manufacturer has certified that the heater meets the requirements under paragraph (1) (2) (i) of this section by permanently marking the heater "**MEETS DOT REQUIREMENTS FOR CATALYTIC HEATERS USED WITH FLAMMABLE LIQUID AND GAS.**"

(F) The heater is also marked "**DO NOT LOAD INTO OR USE IN CARGO COMPARTMENTS CONTAINING FLAMMABLE LIQUID OR GAS IF FLAME IS VISIBLE ON CATALYST OR IN HEATER.**"

(G) Heater requirements under § 393.77 of this title are complied with.

(ii) [Reserved]

(iii) *Restrictions on automatic cargo-space-heating temperature control devices.* Restrictions on these devices have two dimensions: restrictions upon use and restrictions which apply when the device must not be used.

(A) *Use restrictions.* An automatic cargo-space-heating temperature control device may be used when transporting flammable liquid or flammable gas only if each of the following requirements is met—

(1) Electrical apparatus in the cargo compartment is nonsparking or explosion proof.

(2) There is no combustion apparatus in the cargo compartment.

(3) There is no connection for return of air from the cargo compartment to the combustion apparatus.

(4) The heating system will not heat any part of the cargo to more than 130° F. (54° C.).

(5) Heater requirements under § 393.77 of this title are complied with.

(B) *Protection against use.* Flammable liquid or flammable gas may be transported by a vehicle, which is equipped with an automatic cargo-space-heating temperature control device that does not meet each requirement of paragraph (1) (2) (iii) (A) of this section, only if the device is first rendered inoperable, as follows—

(1) Each cargo heater fuel tank, if other than LPG, must be emptied or removed.

(2) Each LPG fuel tank for automatic temperature control equipment must have its discharge valve closed and its fuel feed line disconnected.

(m) *Tanks constructed and maintained in compliance with spec. 106A or 110A (§§ 179.300, 179.301) that are authorized for the shipment of hazardous materials by highway in Part 173 of this*

subchapter must be carried in accordance with the following requirements:

(1) Tanks must be securely chocked or clamped on vehicles to prevent any shifting.

(2) Equipment suitable for handling a tank must be provided at any point where a tank is to be loaded upon or removed from a vehicle.

(3) No more than two cargo carrying vehicles may be in the same combination of vehicles.

(n) Specification 56 or 57 (§§ 178.251, 178.252, 178.253 of this subchapter) portable tanks containing hazardous materials may not be stacked on each other nor may any other freight be stacked on them during transportation.

§ 177.835 Explosives.

(See also § 177.834 (a) to (k).)

(a) *Engine stopped.* No explosives shall be loaded into or on or be unloaded from any motor vehicle with the engine running.

(b) *Care in loading, unloading, or other handling of explosives.* No bale hooks or other metal tools shall be used for the loading, unloading, or other handling of explosives, nor shall any package or other container of explosives, except barrels or kegs, be rolled. No packages of explosives shall be thrown or dropped during process of loading or unloading or handling of explosives. Special care shall be exercised to the end that packages or other containers containing explosives shall not catch fire

from sparks or hot gases from the exhaust tailpipe.

(1) Whenever tarpaulins are used for covering explosives, they shall be secured by means of rope or wire tie downs. Explosives placards or markings required by § 177.823 shall be secured, in the appropriate locations, directly to the equipment transporting the explosives. If the vehicle is provided with placard boards, the placards must be applied to these boards.

(c) *Explosives on vehicles in combination.* Class A explosives may not be loaded into or carried on any vehicle of a combination of vehicles if:

(1) More than two cargo carrying vehicles are in the combination;

(2) Any full trailer in the combination has a wheel base of less than 184 inches;

(3) Any vehicle in the combination is a tank motor vehicle which is required to be marked or placarded under § 177.823 or

(4) The other vehicle in the combination contains any:

(i) Initiating explosive.

(ii) Packages of radioactive materials bearing "Yellow III" labels.

(iii) Class A or B poisons, or

(iv) Hazardous materials in a portable tank or a DOT specification 106A or 110A tank.

(d) [Reserved]

(e) *No sharp projections inside body of vehicles.* No motor vehicle transporting any kind of explosive shall have on the interior of the body in which the explosives are contained, any inwardly projecting bolts, screws, nails, or other inwardly projecting parts likely to produce damage to any package or container of explosives during the loading or unloading process or in transit.

(f) *Explosives vehicles, floors tight and lined.* Motor vehicles transporting class A or class B explosives shall have tight floors: shall have that portion of the interior in contact with the load lined with either non-metallic material or non-ferrous metals, except that the lining is not required for truck load shipments loaded by the Departments of the Army, Navy or Air Force of the United States Government provided the

explosives are of such nature that they are not liable to leakage of dust, powder, or vapor which might become the cause of an explosion. The interior of the cargo space must be in good condition so that there will not be any likelihood of containers being damaged by exposed bolts, nuts, broken side panels or floor boards, or any similar projections.

(g) No blasting cap, regardless of type, may be transported on the same motor vehicle with any Class A or Class B explosive unless—

(1) It is packed in a specification MC 201 (§ 178.318 of this subchapter) container, or

(2) It is packed and loaded in accordance with a method approved by the Department. One method approved by the Department is as follows:

(i) The caps are packed in packagings prescribed in § 173.66(g) of this subchapter which in turn are loaded into portable containers or separate compartments meeting the requirements of the Institute of Makers of Explosives' Standard entitled "IME Standard for the Safe Transportation of Electric Blasting Caps in the Same Vehicle With Other Explosives," dated November 5, 1971 (IME Safety Library Publication No. 22).

(h) *Lading within body or covered tailgate closed.* Except as provided in paragraphs (g), (k), and (m) of this section, dealing with the transportation of liquid nitroglycerin, desensitized liquid nitroglycerin or diethylene glycol dinitrate, other than as defined in § 173.53(e) of this subchapter, all of that portion of the lading of any motor vehicle which consists of explosives shall be contained entirely within the body of the motor vehicle or within the horizontal outline thereof, without overhang or projection of any part of the load and if such motor vehicle has a tailboard or tailgate, it shall be closed and secured in place during such transportation. Every motor vehicle transporting explosives must either have a closed body or have the body thereof covered with a tarpaulin, and in either event care must be taken to protect the load from moisture and sparks, except that subject to other provisions of these regulations, explosives other than black powder may

be transported on flat-bed vehicles if the explosive portion of the load on each vehicle is packed in fire and water resistant containers or covered with a fire and water resistant tarpaulin.

(i) *Explosives to be protected against damage by other lading.* No motor vehicle transporting any explosive may transport as a part of its load any metal or other articles or materials likely to damage such explosive or any package in which it is contained, unless the different parts of such load be so segregated or secured in place in or on the motor vehicle and separated by bulkheads or other suitable means as to prevent such damage.

(j) *Transfer of explosives en route.* No class A or class B explosive shall be transferred from one container to another, or from one motor vehicle to another vehicle, or from another vehicle to a motor vehicle, on any public highway, street, or road, except in case of emergency. In such cases red electric lanterns, red emergency reflectors or red flags shall be set out in the manner prescribed for disabled or stopped motor vehicles. In any event, all practicable means, in addition to these hereinbefore prescribed, shall be taken to protect and warn other users of the highway against the hazard involved in any such transfer or against the hazard occasioned by the emergency making such transfer necessary.

(k) *Loading requirements for liquid nitroglycerin, desensitized liquid nitroglycerin, or diethylene glycol dinitrate.* Liquid nitroglycerin, desensitized liquid nitroglycerin, or diethylene glycol dinitrate, other than as defined in § 173.53(e) of this chapter, may be accepted for transportation and transported only by motor carriers other than common carriers if it be loaded into or on a truck having the type of body specified in spec. MC200 (§ 178.315 of this subchapter). No liquid nitroglycerin, desensitized liquid nitroglycerin or diethylene glycol dinitrate may be loaded directly above any other explosive, or in any quantity in excess of 900 quarts on one motor vehicle or 10 quarts in any one individual

container. Additional quantities of explosives, other than nitroglycerin, desensitized liquid nitroglycerin or diethylene glycol dinitrate, excepting any type of blasting or percussion cap or other detonating device, may be carried on such motor vehicle in a closed or covered bed or body which shall be firmly bolted or fastened above the lid of the compartment containing the nitroglycerin, desensitized liquid nitroglycerin or diethylene glycol dinitrate. In no case shall the net load be more than 7,500 pounds. (See paragraph (m) of this section and spec. MC201 (§ 178.318 of this subchapter).

(l) *Separation of tools and supplies for preparing charges.* Motor vehicles transporting liquid nitroglycerin; desensitized liquid nitroglycerin or diethylene glycol dinitrate, may also transport the tools and supplies necessary for preparing and firing charges thereof: *Provided*, That such tools and supplies be properly secured in place so as to prevent their coming in contact with the body above specified.

(m) *Caps or other explosives.* Any explosive, including desensitized liquid explosives as defined in § 173.53(e) of this subchapter, other than liquid nitroglycerin, desensitized liquid nitroglycerin or diethylene glycol dinitrate, transported on any motor vehicle transporting liquid nitroglycerin, desensitized liquid nitroglycerin or diethylene glycol dinitrate, must be segregated, each kind from every other kind, and from tools or other supplies. Blasting caps must be packed in specification MC 201 (§ 178.318 of this subchapter) containers.

§ 177.836 Nonexplosive material.

(a) No restrictions are prescribed for the packing, handling, and transportation of material relating to ammunition for cannon, but containing no explosive or other dangerous article, such as cartridge cases, "dummy" or "drill" cartridges, etc., sandloaded projectiles, sandloaded bombs, empty projectiles, empty mines, empty

bombs, solid projectiles, or empty torpedoes. Rotating bands should be protected against deformation by method of packing or loading.

§ 177.837 Flammable liquids.

(See also § 177.834 (a) to (k).)

(a) *Engine stopped.* Unless the engine of the motor vehicle is to be used for the operation of a pump, no flammable liquid shall be loaded into, or on, or unloaded from any motor vehicle while the engine is running.

(b) *Bonding and grounding containers other than cargo tanks prior to and during transfer of lading.* For containers which are not in metallic contact with each other, either metallic bonds or ground conductors shall be provided for the neutralization of possible static charges prior to and during transfers of flammable liquids between such containers. Such bonding shall be made by first connecting an electric conductor to the container to be filled and subsequently connecting the conductor to the container from which the liquid is to come, and not in any other order. To provide against ignition of vapors by discharge of static electricity, the latter connection shall be made at a point well removed from the opening from which the flammable liquid is to be discharged.

(c) *Bonding and grounding cargo tanks before and during transfer of lading.* (1) When a cargo tank is loaded through an open filling hole, one end of a bond wire shall be connected to the stationary system piping or integrally connected steel framing, and the other end to the shell of the cargo tank to provide a continuous electrical connection. (If bonding is to the framing, it is essential that piping and framing be electrically interconnected.) This connection must be made before any filling hole is opened, and must remain in place until after the last filling hole has been closed. Additional bond wires are not needed around All-Metal flexible or swivel joints, but are required for nonmetallic flexible connections in the stationary system piping. When a cargo tank is unloaded by a suction-piping system through an open filling hole of the cargo

tank, electrical continuity shall be maintained from cargo tank to receiving tank.

(2) When a cargo tank is loaded or unloaded through a vapor-tight (not open hole) top or bottom connection, so that there is no release of vapor at a point where a spark could occur, bonding or grounding, is not required. Contact of the closed connection must be made before flow starts and must not be broken until after the flow is completed.

(3) Bonding or grounding is not required when a cargo tank is unloaded through a nonvapor-tight connection into a stationary tank provided the metallic filling connection is maintained in contact with the filling hole.

(d) *Pyroforic liquids in cylinders.* Cylinders containing pyroforic liquids, n.o.s., unless packed in strong wooden boxes and secured therein to protect valves, must be loaded with all valves and safety relief devices in the vapor space, and must be secured so that no shifting will occur in transit.

(e) *Manholes and valves closed.* A person shall not drive a tank motor vehicle and a motor carrier shall not require or permit a person to drive a tank motor vehicle containing a flammable liquid (regardless of quantity) unless—

(1) All manhole closures on the cargo tank are closed and secured; and

(2) All valves and other closures in liquid discharge systems are closed and free of leaks.

§ 177.838 Flammable solids and oxidizing materials.

(See also § 177.834 (a) to (k).)

(a) *Lading within body or covered, tailgate closed; pick-up and delivery.* All of that portion of the lading of any motor vehicle transporting flammable solids or oxidizing materials shall be contained entirely within the body of the motor vehicle and shall be covered by such body, by tarpaulins, or other suitable means, and if such motor vehicle has a tailboard or tailgate, it shall

be closed and secured in place during such transportation: *Provided, however,* That the provisions of this paragraph need not apply to "pick-up and delivery" motor vehicles when such motor vehicles are used in no other transportation than in and about cities, towns, or villages.

(b) *Articles to be kept dry.* Special care shall be taken in the loading of any motor vehicle with flammable solids or oxidizing materials which are likely to become hazardous to transport when wet, to keep them from being wetted during the loading process and to keep them dry during transit. Special care shall also be taken in the loading of any motor vehicle with flammable solids or oxidizing materials, which are likely to become more hazardous to transport by wetting, to keep them from being wetted during the loading process and to keep them dry during transit. Examples of such dangerous materials are charcoal screenings, ground, crushed, or pulverized charcoal, and lump charcoal.

(c) *Lading ventilation, precautions against spontaneous combustion.* Whenever a motor carrier has knowledge concerning the hazards of spontaneous combustion or heating of any article to be loaded on a motor vehicle, such article shall be so loaded as to afford sufficient ventilation of the load to provide reasonable assurance against fire from this cause; and in such a case the motor vehicle shall be unloaded as soon as practicable after reaching its destination. Charcoal screenings, or ground, crushed, granulated, or pulverized charcoal, in bags, shall be so loaded that the bags are laid horizontally in the motor vehicle, and so piled that there will be spaces for effective air circulation, which spaces shall not be less than 4 inches wide; and air spaces shall be maintained between rows of bags. Bags shall not be piled closer than 6 inches from the top of any motor vehicle with a closed body.

(d) *Loose or baled nitrate of soda bags.* Loose or baled unwashed, empty bags, having contained nitrate of soda, may be transported in truckload lots only in motor vehicles, and such motor vehicles must have closed or covered bodies lined with paper; such shipments

are required to be loaded by the shipper and to be unloaded by the consignee.

(e) *Staying or blocking of packages of matches.* Special care shall be exercised in the loading of packages containing "strike-anywhere" matches to prevent the shifting or jamming of any such package during transit. To this end, the packages shall be compactly loaded with the strongest dimensions of each box or other container loaded lengthwise of the motor vehicle.

(1) *Smooth vehicle interior for matches.* Unless strike-anywhere matches are contained in wooden outside boxes, special care shall be taken to provide that the inside surfaces of any motor vehicle into which such matches are to be loaded and with which surfaces the containers might come in contact, shall be smooth, without protrusions of any sort, such as bolts, nuts, sharp edges, or corners, etc., and there shall be provided for this purpose smooth wooden inner linings, if the interior of the motor vehicle is not otherwise smooth in accordance with this requirement.

(2) *Flammable liquids.* Matches must not be loaded next to a package bearing a flammable liquid label.

(f) *Nitrates, except ammonium nitrate having organic coating, listed in § 173.182 (b) must be loaded in closed or open type motor vehicles, which must be swept clean and be free of any projections capable of injuring bags when so packaged. When shipped in open type motor vehicles, the lading must be suitably covered. Ammonium nitrate having organic coating must not be loaded in all-metal vehicles, other than those made of aluminum or aluminum alloys of the closed type. (See § 177.823 (a) (4) and (5).)*

(g) *Smokeless powder for small arms* in quantities not exceeding 100 pounds net weight transported in one car or motor vehicle may be classed as a flammable solid when approved for this classification by the Bureau of Explosives. Maximum quantity in any inside packaging must not exceed 8 pounds and inside packagings must be arranged and protected so as to prevent simultaneous ignition of the contents. The complete package must be a type approved by the

Bureau of Explosives. Each outside packaging must bear a flammable solid label.

§ 177.839 Corrosive liquids.

(See also § 177.834 (a) to (k).)

(a) *Nitric acid.* In addition to the requirements set forth in paragraph (b) of this section no carboy or other container of nitric acid shall be loaded above any container containing any other kind of material. The loading of carboys or other containers of nitric acid shall be limited to two tiers high.

(b) *Carboys and frangible containers.* In general, individual carboys and frangible containers of corrosive liquids, including charged electric storage batteries, must, when loaded by hand, be individually loaded into and unloaded from any motor vehicle in which they are to be, or have been, transported. All reasonable precautions must be taken to prevent, by all practicable means, the dropping of any such containers or batteries containing corrosive liquids. No such container or battery may be loaded into a motor vehicle having an uneven floor surface. It shall be permissible to load on or transport in any motor vehicle any authorized carboys or frangible shipping containers, containing corrosive liquids, more than one tier high above any floor only if such carboys or other containers are boxed or crated, or are in barrels or kegs, as required by this subchapter, and only if such containers are so stacked that the weight of each tier above the first is entirely supported by the boxes, crates, barrels, kegs, or other authorized means of enclosing the carboys or frangible containers. Only so many ties as may adequately be so supported without danger of crushing or breaking, shall be permitted. Means must be provided to prevent by all practicable means, in all cases, the shifting of containers or batteries during transit. Nothing contained in this section shall be so construed as to prevent the use of cleats or other retaining means for the purpose of preventing shifting of containers or batteries. For the purposes of this section a false floor or platform, secured against relative motion within the body of

the motor vehicle, shall be deemed to be a floor. (For recommendations for handling leaking or broken packages, see § 177.-858(a).)

(c) *Storage batteries.* In addition to the requirements set forth in paragraph (b) of this section, all storage batteries containing any electrolyte shall be so loaded, if loaded with other lading, that all such batteries will be protected against other lading falling onto or against them; and adequate means shall be provided in all cases for the protection and insulation of battery terminals against short circuits.

(d) *Corrosives in cargo tanks.* A person shall not drive a tank motor vehicle and a motor carrier shall not require or permit a person to drive a tank motor vehicle containing corrosives (regardless of quantity) unless—

(1) All manhole closures on the cargo tank are closed and secured; and

(2) All valves and other closures in liquid discharge systems are closed and free of leaks.

§ 177.840 Compressed gases.

(See also § 177.834 (a) to (k).)

(a) *Floors or platforms essentially flat.* Cylinders containing compressed gases shall not be loaded onto any part of the floor or platform of any motor vehicle which is not essentially flat; cylinders containing compressed gases may be loaded onto any motor vehicle not having a floor or platform only if such motor vehicle be equipped with suitable racks having adequate means for securing such cylinders in place therein. Nothing contained in this section shall be so construed as to prohibit the loading of such cylinders on any motor vehicle having a floor or platform and racks as hereinbefore described.

(1) *Cylinders.* To prevent their overturning, cylinders containing compressed gases must be securely lashed in an upright position; loaded into racks securely attached to the motor vehicle packed in boxes or crates of such dimen-

sions as to prevent their overturning; or loaded in a horizontal position. Specification DOT-4L cylinders must be loaded in an upright position and securely braced.

(2) *Cylinders for liquefied hydrogen.* Specification DOT-4L cylinders containing liquefied hydrogen must be transported only on motor vehicles with open bodies which are equipped with suitable racks or supports having clamps or securing bands capable of holding the cylinders upright when they are subjected to an acceleration of at least 2 "g" in any horizontal direction.

(i) The combined total of the hydrogen venting rates as marked on the cylinders on one motor vehicle must not exceed 60 standard cubic feet per hour

(ii) Motor vehicles loaded with cylinders containing liquefied hydrogen may not be driven through tunnels.

(iii) Highway transportation is limited to private and contract motor carriers only and to direct movement from point of origin to destination.

(b) Portable tank containers containing compressed gases shall be loaded on motor vehicles only as follows:

(1) Onto a flat floor or platform of a motor vehicle.

(2) Onto a suitable frame of a motor vehicle.

(3) In either such case such containers shall be safely and securely blocked or held down to prevent movement relative to each other or to the supporting structure when in transit, particularly during sudden starts and stops and changes of direction of the vehicle.

(4) Requirements of subparagraphs (1) and (2) of this paragraph shall not be construed as prohibiting stacking of containers provided the provisions of subparagraph (3) of this paragraph are fully complied with.

(c) [Reserved]

(d) Engine to be stopped in tank motor vehicles, except for transfer pump. No flammable compressed gas shall be loaded into or on or unloaded from any tank motor vehicle with the engine running unless the engine is used for the operation of the transfer pump of the vehicle. Unless the delivery hose is equipped with a shut-off valve at its discharge end, the

engine of the motor vehicle shall be stopped at the finish of such loading or unloading operation while the filling or discharge connections are disconnected.

(e) Chlorine cargo tanks shall be shipped only when equipped (1) with a gas mask of a type approved by the U.S. Bureau of Mines for chlorine service; (2) with an emergency kit for controlling leaks in fittings on the dome cover plate.

(f) No chlorine tank motor vehicle used for transportation of chlorine shall be moved, coupled or uncoupled, when any loading or unloading connections are attached to the vehicle, nor shall any semi-trailer or trailer be left without the power unit unless such semi-trailer or trailer be checked or equivalent means be provided to prevent motion.

(g) Each liquid discharge valve on a cargo tank, other than an engine fuel line valve, must be closed during transportation except during loading and unloading.

appropriate method, and the marking removed.

(b) No Class A or irritating materials in cargo tanks. No poison, Class A, or irritating material may be loaded into or transported in any cargo tank.

(c) *Class A poisons or irritating materials.* The transportation of a Class A poison or an irritating material is not permitted if there is any interconnection between packagings.

(d) *Poisons in cargo tanks.* A person shall not drive a tank motor vehicle and a motor carrier shall not require or permit a person to drive a tank motor vehicle containing poisons (regardless of quantity) unless—

(1) All manhole closures on the cargo tank are closed and secured; and

(2) All valves and other closures in liquid discharge systems are closed and free of leaks.

(e) A carrier may not transport a package bearing a poison label in the same transport vehicle with material that is marked as or known to be food-stuff, feed or any other edible material intended for consumption by humans or animals.

§ 177.841 Poisons.

(See also § 177.834 (a) to (k).)

(a) *Arsenical compounds in bulk.* Care shall be exercised in the loading and unloading of "arsenical dust", "arsenic trioxide", and "sodium arsenate", allowable to be loaded into sift-proof, steel hopper-type or dump-type motor-vehicle bodies equipped with water-proof, dust-proof covers well secured in place on all openings, to accomplish such loading with the minimum spread of such compounds into the atmosphere by all means that are practicable; and no such loading or unloading shall be done near or adjacent to any place where there are or are likely to be, during the loading or unloading process assemblages of persons other than those engaged in the loading or unloading process, or upon any public highway or in any public place.

(1) The motor vehicles must be marked in accordance with § 173.368(b) of this chapter.

(2) Before any motor vehicle may be used for transporting any other articles, all detectable traces of arsenical materials must be removed therefrom by flushing with water, or by other ap-

§ 177.842 Radioactive material.

(a) The number of packages of radioactive materials in any motor vehicle, trailer, or storage location must be limited so that the total transport index number, as defined in § 173.389(i) of this subchapter and determined by adding together the transport index numbers on the labels of the individual packages, does not exceed 50. This provision does not apply to exclusive use shipments described in § 173.393(j), 173.396(f), or 173.392 of this subchapter.

(b) Packages of radioactive material bearing "radioactive yellow-II" or "radioactive yellow-III" labels must not be placed in a motor vehicle or in any other place closer than the distances shown in the following table to any area which may be continuously occupied by passengers, employees, or shipments of animals, nor closer than the distances shown in the table below to any package containing undeveloped film (if so

marked). If more than one of these packages is present, the distance shall be computed from the following table on the basis of the total transport index number (determined by adding together the transport index numbers on the labels of the individual packages) or packages in the vehicle or storeroom. Where more than one group of packages is present in any single storage location, a single group may not have a total transport index greater than 50. Each group of packages must be handled and

stowed not closer than 6 meters (20 feet) (measured edge to edge) to any other group.

(c) Shipments of low specific activity materials, as defined in § 173.391 of this subchapter, must be loaded so as to avoid spillage and scattering of loose materials. Loading restrictions are set forth in § 173.397 of this subchapter.

(d) Packages must be so blocked and braced that they cannot change position during conditions normally incident to transportation.

Total transport index	Minimum separation distances in feet to nearest undeveloped film for various times of transit					Minimum distance in feet to area of persons, or minimum distance in feet from dividing partition of cargo compartments
	Up to 2 hours	2-4 hours	4-8 hours	8-12 hours	Over 12 hours	
None.....	0	0	0	0	0	0
0.1 to 1.0.....	1	2	3	4	5	1
1.1 to 5.0.....	2	4	6	8	11	2
5.1 to 10.0.....	4	6	9	11	15	3
10.1 to 20.0.....	5	8	12	16	22	4
20.1 to 30.0.....	7	10	15	20	29	5
30.1 to 40.0.....	8	11	17	22	33	6
40.1 to 50.0.....	9	12	19	24	36	7

NOTE 1: The distance in the table must be measured from the nearest point on the packages of radioactive materials.

(e) Persons should not remain unnecessarily in a vehicle containing radioactive materials.

(f) Each fissile class III radioactive material shipment (as defined in § 173.389(a) (3) of this subchapter) must be transported in accordance with one of the methods prescribed in § 173.396(g) of this subchapter. The transport controls must be adequate to assure that no fissile class III shipment is transported in the same transport vehicle with any other fissile radioactive material shipment. In loading and storage areas each fissile class III shipment must be segregated by a distance of at least 20 feet from other packages required to bear one of the "Radioactive" labels described in § 173.416 of this subchapter.

materials in truckload lots under the provisions of § 173.392(d) of this subchapter must be surveyed with appropriate radiation detection instruments after each use. Carriers must not return such vehicles to service until the radiation dose rate at any accessible surface is not more than 0.5 millirem per hour, and there is no significant removable radioactive surface contamination (see § 173.399 of this subchapter).

(b) This section does not apply to any vehicle used solely for transporting radioactive material if a survey of the interior surface shows that the radiation dose rate does not exceed 10 millirem per hour at the interior surface or 2 millirem per hour at 3 feet from any interior surface. These vehicles must be stenciled with the words "For Radioactive Materials Use Only" in lettering at least 3 inches high in a conspicuous place, on both sides of the exterior of the vehicle. These vehicles must be kept closed at all times other than loading and unloading.

(c) In case of fire, accident, breakage, or unusual delay involving shipments of radioactive material, see § 177.861.

§ 177.843 Contamination of vehicles.

(a) Each motor vehicle used for transporting low specific activity radioactive

[illegible]

may be loaded, transported or stored with high explosives or with blasting caps or electric blasting cable, and detonating primers.

¹ Normal uranium, depleted uranium, and thorium metal in solid form may also be loaded and transported with articles named in vertical and horizontal columns a, b, c, d, e, f, and g.

NOTE 1: Charged electric storage batteries must not be loaded in the same vehicle with explosives, class A.

NOTE 2: Cyanides or cyanide mixtures must not be loaded or stored with acids or corrosive liquids.

NOTE 3: Gas identification sets may be loaded and transported with all articles named except those in column c.

NOTE 4: Nitric acid, when loaded in the same motor vehicle with other acids or other corrosive liquids in carboys, must be separated from the other carboys. A 2 by 8 inch plank, set on edge, should be nailed across the motor vehicle floor at least 12 inches from the nitric acid carboys, and the space between the plank and the carboys of nitric acid should be filled with sand, sifted ashes, or other incombustible absorbent material.

NOTE 5: Smokeless powder for small arms in quantities not exceeding 100 pounds net weight in one motor vehicle shall be classed as a flammable solid for purposes of transportation when approved for such classification by the Bureau of Explosives.

Subpart D—Vehicles and Shipments in Transit; Accidents

§ 177.853 Transportation and delivery of shipments.

(a) *No unnecessary delay in movement of shipments.* All shipments of hazardous materials shall be transported without unnecessary delay, from and including the time of commencement of the loading of the cargo until its final discharge at destination.

(b) *Delivery at destination.* Shipments of hazardous materials which are refused by the consignees, or which can not be delivered within 48 hours after arrival at destination, must be promptly disposed of (1) by return to the shipper, if in proper shipping condition, or (2) by storage, provided a suitable storage place for such articles is available, or (3) by sale, or (4) when necessary to safety, by destruction: *Provided*, That charged electric batteries may be held for 30 days after arrival at destination, pending delivery or disposition.

(c) *Delivery to authorized person, or magazine.* Every shipment of dangerous explosives by motor vehicle shall be delivered only to someone authorized to receive it, except such explosives shipments as are placed in magazines which are immediately thereafter locked.

§ 177.854 Disabled vehicles and broken or leaking packages; repairs.

(See also Forbidden articles, § 177.821)

(a) *Care of lading, hazardous materials.* Whenever for any cause other than necessary traffic stops any motor vehicle transporting any hazardous material is stopped upon the traveled portion of any highway or shoulder thereof, special care shall be taken to guard the vehicle and its load or to take such steps as may be necessary to provide against hazard. Special effort shall be made to remove the motor vehicle to a place where the hazards of the materials being transported may be provided against. See the Illinois Vehicle Code for warning devices required to be displayed on the highway.

(b) *Disposition of containers found broken or leaking in transit.* When leaks occur in packages or containers during the course of transportation, subsequent to initial loading, disposition of such package or container shall be made by the safest practical means afforded under paragraphs (c), (d), and (e) of this section.

(c) *Repairing packages.* Packages may be repaired when safe and practicable, such repairing to be in accordance with the best and safest practice known and available.

(d) *Transportation of repaired packages.* Any package repaired in accordance with the requirements of paragraph (c) of this section, except as provided in §§ 177.855 (c), 177.856 (c), and 177.858 (b), may be transported to the nearest place at which it may safely be disposed of only in compliance with the following requirements:

(1) The package must be safe for transportation.

(2) The repair of the package must be adequate to prevent contamination of or hazardous admixture with other lading transported on the same motor vehicle therewith.

(3) If the carrier is not himself the shipper, the consignee's name and address must be plainly marked on the repaired package.

(e) *Disposition of unsafe broken packages.* In the event any leaking package or container cannot be safely and adequately repaired for transportation or transported, it shall be stored pending proper disposition in the safest and most expeditious manner possible.

(f) *Stopped vehicles; other dangerous articles.* Whenever any motor vehicle transporting flammable liquids, flammable solids, oxidizing materials, corrosive materials, compressed gases, or poisons, is stopped for any cause other than necessary traffic stops upon the traveled portion of any highway, or a shoulder next thereto, the following requirements shall be complied with during the period of such stop:

(1) For motor vehicles other than cargo tank motor vehicles used for the transportation of flammable liquids or flammable compressed gases and not transporting explosives, Class A, or Class B, warning devices must be set out in the manner prescribed by the Illinois Vehicle Code.

(2) For cargo tank motor vehicles used for the transportation of flammable liquids or flammable compressed gases, whether loaded or empty, and vehicles transporting explosives Class A or Class B, warning devices must be set out in the manner prescribed by the Illinois Vehicle Code.

(g) *Repairs to disabled vehicles.* No repairs shall be made on any motor vehicle containing hazardous materials ex-

cept in case such repairs may be made without hazard; nor shall any such loaded motor vehicle be repaired in a closed garage.

(h) *No repair with flame unless gas-free.* No repair of a cargo tank used for the transportation of any flammable liquid or poisonous liquid, or any compartment thereof, or of any container for fuel of whatever nature, may be repaired by any method employing a flame, arc, or other means of welding, unless the tank or compartment shall first have been made gas-free.

§ 177.855 Accidents; explosives.

(a) *Vehicle disabled; warning of nearby persons; removal of explosives.* In the event of an accident involving any motor vehicle transporting any explosives, every available means shall be employed to prevent individuals, other than those employed in the protection of persons or property or in the removal of hazards or wreckage, from congregating in the vicinity; such means shall also be employed to prevent smoking, to keep flame away, and to safeguard against the aggravation of the hazard present, and to warn other users of the highway. In the event that any motor vehicle laden with or carrying dangerous explosives is entangled with another or with any other object or structure, following an accident, no attempt shall be made to disentangle either vehicle, or the laden vehicle from the object or structure, until the lading, together with any fragments thereof, be removed to a place at least 200 feet from the vehicle (and preferably 200 feet from any habitation). In the event of fire, involving a motor vehicle laden with any explosive, every practicable effort shall be made to give warning of danger of explosion to habitants in the vicinity and to other users of the highway.

(b) *Disposition of spilled or leaking explosives.* In the event of any accident involving any motor vehicle transporting any explosive in which packages are broken, all unbroken packages and as much of any broken packages as possible shall be carefully gathered and removed to a place of safety, in order to prevent fire or explosion. In clearing any wreck

in which a motor vehicle containing any explosive is involved, care shall be exercised not to produce sparks with tools or by other means in moving of or working about the wreckage, so as to avoid as far as possible fires or explosions.

(c) *Explosives packages in transit capable of repair.* Any package of explosives found injured or broken in transit may be repaired or recoopered when this is evidently practicable and not dangerous. When a box that contains any explosive is so damaged that it cannot be repaired it should be reinforced by stout wrapping paper and twine, placed in another strong box, and surrounded by dry, fine sawdust, or dry and clean cotton waste, or elastic wads made from dry newspapers. The box cover should then be securely attached. A ruptured can or keg should be inclosed in a grain bag of good quality, and boxed. Injured packages thus protected, and properly marked with name of contents and consignee's name and address, may be carried to destination: *Provided, however,* That the motor carrier, if himself the shipper, need not mark his own name and address on the package.

(d) *Liquid nitroglycerin, desensitized liquid nitroglycerin or diethylene glycol dinitrate.* When any liquid nitroglycerin, desensitized liquid nitroglycerin or diethylene glycol dinitrate has been spilled on any portion of any motor vehicle it shall be washed with a suitable neutralizing agent until all of any such spillage shall have become completely neutralized.

NOTE 1: Liquid nitroglycerin, desensitized liquid nitroglycerin or diethylene glycol dinitrate may be destroyed by use of a solution composed of:

60 percent commercial sodium sulfide.....	1 ounce.
Denatured alcohol.....	7½ fluid ounces.
Acetone.....	2 fluid ounces
Water.....	3 fluid ounces

(e) *Explosives other than liquid nitroglycerin, desensitized liquid nitroglycerin or diethylene glycol dinitrate.* When particles of any explosive composition other than liquid nitroglycerin desensitized liquid nitroglycerin or diethylene glycol dinitrate have escaped from a damaged container to the floor of the body of the carrier's motor vehicle the floor shall be thoroughly swept and any absorbed portion removed.

(f) *Unrepatrable explosives packages.* When any package of explosives in transit is found to be leaking or damaged

and cannot be recovered, it may not be transported beyond the minimum distance necessary to reach a place where the explosive may be disposed of with safety, except as provided in § 177.854 (e) and paragraph (c) of this section.

§ 177.856 Accidents; flammable liquids.

(a) *Accident to vehicle; warnings; no sparks or flame.* In the event of an accident involving any motor vehicle transporting any flammable liquid every available means shall be employed to prevent individuals, other than those employed in the protection of persons or property or in the removal of hazards or wreckage, from congregating in the vicinity; such means shall also be employed to prevent smoking, to keep fires or flame away, to safeguard against the hazard present, and to warn other users of the highway. (See also § 177.807.)

(b) *Present leakage from spreading.* Whenever any flammable liquid is escaping from a container, all practical means shall be taken to prevent such liquid from spreading over a wide area, from flowing into sewers and streams, and from becoming ignited.

(c) *Disposition of contents of cargo tank when unsafe to continue.* In the event of a leak in a cargo tank of such a character as to make further transportation unsafe, the leaking vehicle should be removed from the traveled portion of the highway; and every available means employed for the safe disposal of the leaking liquid by preventing, so far as practicable, its spread over a wide area, such as by digging trenches to drain to a hole or depression in the ground, diverting the liquid away from streams or sewers if possible, or catching the liquid in containers if practicable. Smoking and the lighting of cigarettes, cigars, or pipes in the vicinity is prohibited, and fires or flames in the vicinity of the leaking cargo tank must be extinguished.

(d) *Transfer of flammable liquids en route.* No flammable liquid shall be transferred from one container to another, or from one motor vehicle to another vehicle, or from another vehicle to a motor vehicle, on any public highway, street, or road, except in case of emergency. In such cases warning devices must be set out in the manner prescribed by the Illinois Vehicle Code. In any event, all practicable means, in addition to those hereinbefore prescribed, shall be taken to

protect and warn other users of the highway against the hazard involved in any such transfer, or against the hazard occasioned by the emergency making such transfer necessary. Nothing contained in this rule shall be so construed as to prohibit the fueling of machinery or vehicles used in road construction and maintenance.

(e) *Transportation of leaking cargo tanks.* A leaking cargo tank may only be transported the minimum distance necessary to reach a place where the contents of the tank or compartment may be disposed of with safety. Every available means must be utilized to prevent the leakage or spillage of the liquid upon the highway.

§ 177.857 Accidents; flammable solids and oxidizing materials.

(a) *Dangerous articles spilled; warning of nearby persons.* In the event of any accident involving any motor vehicle in which any flammable solid or oxidizing material may have become spilled, every practicable and available means shall be taken to warn all approaching persons of the hazard of fire.

(b) *Prevent spread of fire where possible.* Care shall be exercised in the event of damage to packages of flammable solids or oxidizing material which either have been or may be on fire to limit the spread of the fire.

(c) *Disposition of spilled or leaking materials.* In the event of any accident involving any motor vehicle transporting any flammable solid or oxidizing material in which packages are broken, as much as possible of any broken packages shall be carefully gathered and removed to a place of safety, and if the removal of unbroken packages from the motor vehicle would decrease the hazard of fire or other hazard, they shall be removed. The handling of any such materials not contained in packages shall be such as to promote the greatest safety to other users of the highway.

(d) *Reloading of damaged packages of matches; repairs.* In the event of damage to matches or packages of matches by fire or by water in extinguishing a fire in transit, they shall be reloaded in accordance with the applicable requirements for the packing and

loading of matches. Great care shall be taken, however, first to examine and repair any damage to outside containers before reloading, and all loose matches shall be destroyed. Smoking boxes of matches shall not be opened in the vicinity of the remainder of the lading. Such boxes shall be destroyed at a safe distance from the motor vehicle, preferably by burning, and shall not be left, either smoking or burning.

(e) *Calcium hypochlorite compounds, dry, involved in fires.* Calcium hypochlorite compounds, dry, packed in metal drums when involved in motor vehicles where fire has occurred from any cause must be held at least five days before forwarding. Drums showing evidence of spontaneous heating or stress from internal pressure must not be reshipped.

§ 177.858 Accidents; corrosive materials.

(a) *Accident to vehicle; other lading damaged; vehicle washed.* In the event of any accident involving any motor vehicle transporting corrosive materials in which has been involved the breakage, spillage, or leakage of containers of such materials, care shall be exercised in the handling of any other lading which may have become damaged thereby so as to minimize the hazard in handling such damaged lading during the unloading process. The interior or any other parts of the motor vehicle upon which a corrosive liquid may have become spilled shall be thoroughly washed with water as soon after the unloading process as feasible and prior, in any event, to the subsequent reloading of the motor vehicle. (See also § 177.807.)

(b) *Leaking cargo tanks.* In the event of leakage of liquid from any cargo tank or any compartment thereof used for the transportation of corrosive liquids, which develops or is discovered subsequent to the commencement of transportation, any one of the following means, or any means in addition to those herein prescribed, equally or more effective, shall be employed to minimize further hazard:

(1) Further to transport the cargo tank only the minimum distance to reach a place where the contents of the tank or compartment which is leaking may be disposed of with safety, meanwhile employing every available means to prevent the spillage or leaking of any liquid on the highway.

(2) In the event the leak is of such a character as to make further transportation of the cargo tank unsafe, to draw off the traveled portion of the highway, and to employ every available means for the safe disposal of the leaking liquid by preventing, so far as practicable, its spread over a wide area, as by absorbing by means of the use of noncombustible absorbent material, such as fine ashes, sand, earth, etc., or by any other practicable means; by digging trenches to drain to a hole or depression in the ground; by diverting the liquid away from streams or sewers if possible; or by catching the liquid in containers if practicable. So far as practicable, every available means shall be employed to prevent the congregation of spectators and to prevent them from coming in contact with the liquid or its fumes. All available means shall be taken to prevent injury or damage to other users of the highway, or to livestock or farm animals, which might be occasioned by the unloading of the corrosive liquid.

§ 177.859 Accidents; compressed gases

(a) *Accident to vehicle; warnings; keep fire away.* In the event of an accident involving any motor vehicle transporting any compressed gas, the release of which would constitute a hazard to other users of the highway, due care shall be taken that only persons employed in the removal of hazards or wreckage shall be allowed in proximity to the motor vehicle, and the shipper should be notified. In such cases, every practicable and available means shall be taken to warn all approaching persons of the danger involved and to caution them against the use of matches or flame-producing devices, if the gas is flammable

(b) Transfer of flammable gas en route; no flame or sparks. No flammable compressed gas shall be transferred from one container to another, or from one tank motor vehicle to another tank vehicle, or from another tank vehicle to a tank motor vehicle, on any public highway, street, or road, except in case of emergency. In such cases every precaution shall be taken to prevent the escape of gas. Warning devices must be set out in the manner prescribed by the Illinois Vehicle Code. All cargo tanks involved in such transfer shall be grounded. The

transfer shall be made only during daylight, unless the emergency occurs at night or extends into hours of darkness and the hazard would be increased by waiting until daylight. In any such event, all practicable means, in addition to those hereinbefore prescribed, shall be taken to protect and warn other users of the highway against the hazard involved in any such transfer, or against the hazard occasioned by the emergency making such transfer necessary. Every precaution shall be taken to prevent the ignition of any flammable compressed gas from any source; and when it is possible to prevent the congregation of persons not directly concerned with the emergency, this shall be done. Every practicable precaution shall be taken to keep flames or fire away from the scene of the emergency and to prevent smoking or the lighting of pipes, cigars, or cigarettes. Similarly, special care shall be exercised in the operation of any engine, whether of the motor vehicles involved or any other, and where the operation of any such engine would be likely to produce ignition of the flammable compressed gas, the transfer shall be accomplished by other means, if possible. Nothing contained in this section shall be so construed as to prohibit the fueling of machinery or vehicles used in road construction and maintenance.

§ 177.860 Accidents or leakage: poisons.

(a) *Accident to vehicle; warnings; no sparks of flame.* In the event of an accident involving any motor vehicle transporting any poison which is flammable, noxious, or toxic, every available means shall be employed in the protection of persons or property or in the removal of hazards or wreckage, from congregating in the vicinity; such means shall also be employed to prevent smoking, to keep flame away, to safeguard against the aggravation of the hazard present, and to warn other users of the highway. Care shall also be taken to prevent any poison, whether flammable or nonflammable, from contaminating streams or flowing or being spilled into sewers, and poison in powdered form from being scattered by wind. (See also § 177.807.)

(1) *Leakage.* A vehicle which has been used to transport material marked as or known to be poison (class A or B) must be inspected for contamination before reuse. A vehicle which has been contaminated must not be returned to service until such contamination has been removed. This subparagraph does not apply to vehicles used solely for transporting such poisons so long as they are used in that service.

(b) *Leaking cargo tanks.* In the event of leakage of liquid from any cargo tank or any compartment thereof used for the transportation of any poison which is also flammable, or which would come also within the definition of a flammable liquid, or of any gas or combination of gas and liquid, or any poison which would come within the definition of a compressed gas, the requirements shall be the same as those set forth for flammable liquids and compressed gases. In addition, all possible care shall be taken to warn bystanders or other users of the highway against the hazard of inhaling vapors or coming in contact with the poison.

§ 177.861 Accidents; radioactive materials.

(a) In addition to the incident reporting requirements of §§ 171.15 and 171.16 of this subchapter, the carrier must also notify the shipper at the earliest practicable moment following any incident in which there has been breakage, spillage, or suspected radioactive contamination involving radioactive materials shipments. Vehicles, buildings, areas, or equipment in which radioactive materials have been spilled may not be again placed in service or routinely occupied until the radiation dose rate at any accessible surface is less than 0.5 millirem per hour and there is no significant removable radioactive surface contamination (see § 173.397 of this subchapter).

NOTE 1: In these instances, the package or materials should be segregated as far as practicable from personnel contact. If radiological advice or assistance is needed, the U.S. Atomic Energy Commission should also be notified. In case of obvious leakage, or if it

appears likely that the inside container may have been damaged, care should be taken to avoid inhalation, ingestion, or contact with the radioactive material. Any loose radioactive material should be left in a segregated area and held pending disposal instructions from qualified persons.

NOTE 2: Details involving the handling of radioactive materials in the event of an accident can be found in Bureau of Explosives' Pamphlets 1 and 2.

(b) *Cleaning vehicles.* See § 177.843.

Subpart E—Regulations Applying to Hazardous Material on Motor Vehicles Carrying Passengers for Hire

§ 177.870 Regulations for passenger carrying vehicles.

(a) Vehicles transporting passengers and property. In addition to the regulations in this subchapter the following requirements shall apply to vehicles transporting passengers and property.

(b) No explosives or other hazardous materials on passenger-carrying vehicles, exceptions. No hazardous materials except emergency shipments of drugs, chemicals and hospital supplies, and the accompanying munitions of war of the Departments of the Army, Navy, and Air Force of the United States Government, are authorized by this subchapter to be transported on motor vehicles carrying passengers for hire where other practicable means of transportation is available.

(c) Explosives in passenger-carrying space forbidden. No explosive may be carried in the passenger-carrying space of any motor vehicle transporting passengers for hire.

(d) Explosives on passenger-carrying vehicles; quantity. Where no other practicable means of transportation is available the following articles in the quantities as shown may be transported in motor vehicles carrying passengers for hire in a space other than that provided for passengers: Not to exceed 100 pounds gross weight of any or all of the kinds of explosives permitted to be transported by cargo-only aircraft (172.101 column (6) (b)), may be transported on a motor vehicle transporting passengers: Provided however, That samples of explosives for laboratory exami-

nation, not exceeding a net weight of one-half pound each, and not exceeding 20 samples or not to exceed a total of 100 blasting caps at one time in a single motor vehicle, may be transported in a motor vehicle transporting passengers. (See § 172.5 of this subchapter.)

(e) Articles other than explosives on passenger-carrying vehicles. The gross weight of any given class of hazardous material other than explosives shall not exceed 100 pounds, and the aggregate weight of all such other dangerous articles shall not exceed 500 pounds. This provision does not apply to nontoxic, nonflammable refrigerants, when such refrigerant is for servicing operations of a motor carrier on whose motor vehicles the refrigerant is used. A cylinder secured against movement while in transit and not exceeding 250 pounds gross weight may be transported.

(f) Poisons on passenger-carrying vehicles. No motor carrier may transport any extremely dangerous poison, class A, any tear gas or irritating substance, any less dangerous poison, class B, which is a liquid, or any paranitraniline, in any amount, in or on any bus while engaged in the transportation of passengers; or any less dangerous poison, class B, which is other than a liquid, in any amount exceeding an aggregate of 100 pounds gross weight in or on any such bus.

(g) Radioactive materials. In addition to the limitations prescribed in paragraphs (b) and (e) of this section, no person may transport any radioactive material requiring labels under § 173.416 of this subchapter in or on any motor vehicle carrying passengers for hire except where no other practicable means of transportation is available. Packages of radioactive materials must be stored only in the trunk or baggage compartment of the vehicle, and must not be stored in any compartment occupied by persons. Packages of radioactive materials must be handled and placed in the vehicle as prescribed in § 177.842.

Subpart F - Out-Of-Service Vehicles Transporting Hazardous Materials

§ 177.900 Out-of-service declaration

(a) General requirements. When any State Police Officer observes a vehicle transporting hazardous materials in a manner that the State Police Officer

believes constitutes an imminent danger, such officer shall prevent the further movement of the vehicle carrying the hazardous material. An imminent danger exists if, in the opinion of the officer on the scene, there is a likelihood that death, serious illness, or severe personal injury will occur prior to the completion of a formal proceeding initiated to abate the risk of such harm. See § 107.307 and § 107.309.

(b) Specific requirements. An out-of-service declaration may be issued on the basis of mechanical condition; visible leaks; loss of package integrity measurable by instrumentation or sensorial perception; improper loading, blocking, or bracing; or damage sufficient to warrant questionable safety.

(c) Vehicles declared out-of-service.

(1) When any vehicle is declared out-of-service for reasons stated in subparagraph (a) or (b) of this section, the reasons for the out-of-service declaration shall be noted on Form DLE-85, "Notice of Apparent Violation." An out-of-service sticker shall be affixed to the vehicle indicating date, time, location, and reason for out-of-service declaration.

(2) No motor carrier shall require or permit any person to operate any vehicle declared and marked out-of-service until all unsafe conditions noted and all repairs required by the out-of-service notice on Form DLE-85 have been satisfactorily corrected or completed. The term "operate" as used in this section shall include towing the vehicle, provided, however, that vehicles marked out-of-service may be towed away by means of a vehicle using a crane or hoist, and provided further that any unsafe condition would not be aggravated by such towing, and that the vehicle combination consisting of the emergency towing vehicle and the out-of-service vehicle meets all other requirements of the Illinois Vehicle Code.*

(3) No person shall remove the out-of-service vehicle sticker from any motor vehicle prior to completion of all repairs and correction of the cited unsafe conditions as required by the out-of-service notice on Form DLE-85.

*Illinois Revised Statutes, Chapter 95 1/2.

PART 178—SHIPPING CONTAINER SPECIFICATIONS

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178.5	Specification 1X; boxed carboys, 5 to 6½ gallons, for export only.
178.6	Specification 1EX; glass carboys in plywood drums.
178.7	Specification 1E; glass carboys in plywood drums.
178.8	Specification 28; metal-jacketed lead carboys.
178.9	Specification 28A; metal-jacketed lead carboys.
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178.13	Specification 1H; polyethylene carboys in low carbon steel or other equally efficient metal crates.
178.14	Specification 1K; glass carboys cushioned with expandable polystyrene in wooden wirebound box outside containers.
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178.19	Specification 34; reusable molded polyethylene container for use without overpack. Removable head not authorized.
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178.20	Specification 2A; inside containers, metal cans, pails and kits.
178.21	Specification 2T; polyethylene container.
178.22	Specification 2C; inside containers, corrugated fiberboard cartons.
178.23	Specification 2D; inside containers, duplex paper bags.
178.24	Specification 2U; molded or thermoformed polyethylene containers having rated capacity of over one gallon. Removable head containers or containers fabricated from film not authorized.
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178.26	Specification 2G; inside containers, fiber cans and boxes.
178.27	Specification 2TL; polyethylene container.
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- 178.29 Specification 2K; inside containers, paper bags for linings.
- 178.30 Specification 2L; lining for boxes.
- 178.31 Specification 2M; waterproofed paper lining.
- 178.32 Specification 2N; inside containers, metal cans.
- 178.33 Specification 2P; inside nonrefillable metal containers.
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- 178.35 Specification 2S; polyethylene container.
- 178.35a Specification 2SL; molded or thermofomed polyethylene container.

Subpart C—Specifications for Cylinders

- 178.36 Specification 3A; seamless steel cylinders or 3AX; seamless steel cylinders of capacity over 1,000 pounds water volume.
- 178.37 Specification 3AA; seamless steel cylinders made of definitely prescribed steels or 3AAX; seamless steel cylinders made of definitely prescribed steels of capacity over 1,000 pounds water volume.
- 178.38 Specification 3B; seamless steel cylinders.
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- 178.40 Specification 3C; seamless steel cylinders.
- 178.41 Specification 3D; seamless steel cylinders.
- 178.42 Specification 3E; seamless steel cylinders.
- 178.43 Specification 3A480X; seamless steel cylinders.
- 178.44 [Reserved]
- 178.45 Specification 3T; seamless steel cylinders.
- 178.47 [Reserved]
- 178.48 Specification 4; forge welded steel cylinders.
- 178.49 Specification 4A; forge welded steel cylinders.
- 178.50 Specification 4B; welded and brazed steel cylinders.
- 178.51 Specification 4BA; welded or brazed steel cylinders made of definitely prescribed steels.
- 178.52 Specification 4C; welded and brazed steel cylinders.
- 178.53 [Reserved]
- 178.54 Specification 4B240-FLW; welded or welded and brazed cylinders with fusion-welded longitudinal seam.

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- 178.55 Specification 4B240ET; welded and brazed cylinders made from electric resistance welded tubing.
- 178.56 Specification 4AA480; welded steel cylinders made of definitely prescribed steels.
- 178.57 Specification 4L; welded cylinders insulated.
- 178.58 [Reserved]
- 178.59 Specification 8; steel cylinders with approved porous filling for acetylene.
- 178.60 Specification 8AL; steel cylinders with approved porous filling for acetylene.
- 178.61 Specification 4BW; welded steel cylinders made of definitely prescribed steels with electric-arcwelded longitudinal seam.
- 178.63 [Reserved]
- 178.65 Specification 39; non-reusable (non-refillable) cylinders.
- 178.66 [Reserved]
- 178.67 [Reserved]
- 178.68 Specification 4E; welded aluminum cylinders.

Subpart D—Specifications for Metal Barrels, Drums, Kegs, Cases, Trunks, and Boxes

- 178.80 Specification 5; steel barrels or drums.
- 178.81 Specification 5A; steel barrels or drums.
- 178.82 Specification 5B; steel barrels or drums.
- 178.83 Specification 5C; steel barrels or drums.
- 178.84 Specification 5D; steel barrels or drums, lined.
- 178.85 Specification 5F; steel drums.
- 178.87 Specification 5H; steel barrels or drums, lead lined.
- 178.88 Specification 5K; nickel barrels or drums.
- 178.89 Specification 5L; steel barrels or drums.
- 178.90 Specification 5M; monel drums.
- 178.91 Specification 5X; steel drums, aluminum lined.
- 178.92 Specification 5P; lagged steel drums.
- 178.97 Specification 6A; steel barrels or drums.
- 178.98 Specification 6B; steel barrels or drums.
- 178.99 Specification 6C; steel barrels or drums.
- 178.100 Specification 6J; steel barrels and drums.
- 178.101 Specification 6K; steel barrels or drums.
- 178.102 Specification 6D; cylindrical steel overpack, straight sided, for inside plastic container.

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Subpart G—Specifications for Bags, Cloth, Burlap, Paper or Plastic

- 178.230 Specification 36A; lined cloth bags (triplex).
- 178.233 Specification 36B; burlap bags, lined.
- 178.234 Specification 36C; burlap bags, paper lined.
- 178.236 Specification 44B; multiwall paper bags.
- 178.237 Specification 44C; multiwall paper bags.
- 178.238 Specification 44D; multiwall paper bags.
- 178.239 Specification 44E; multiwall paper bags.
- 178.240 Specification 45B; bags, cloth and paper, lined.
- 178.241 Specification 44P; all-plastic bags.

Subpart H—Specifications for Portable Tanks

- 178.245 Specification 51; steel portable tanks.
- 178.251 General design and construction requirements applicable to specifications 56 (§ 178.252) and 57 portable tanks (§ 178.253).
- 178.252 Specification 56; metal portable tank.
- 178.253 Specification 57; metal portable tank.
- 178.255 Specification 60; steel portable tanks.

Subpart I—[Reserved]**Subpart J—Specifications for Containers for Motor Vehicle Transportation**

- 178.315 Specification MC 200; containers for liquid nitroglycerin, desensitized liquid nitroglycerin or diethylene glycol dinitrate.
- 178.318 Specification MC 201; container for blasting caps, electric blasting caps, and percussion caps.
- 178.337 Specification MC 331; cargo tanks constructed of steel, primarily for transportation of compressed gases as defined in the Compressed Gas Section.
- 178.340 General design and construction requirements applicable to specifications MC 306 (§ 178.341), MC 307 (§ 178.342), and MC 312 (§ 178.343) cargo tanks.
- 178.341 Specification MC 306; cargo tanks.
- 178.342 Specification MC 307; cargo tanks.
- 178.343 Specification MC 312; cargo tanks.

Subpart K—Specifications for General Packaging

- 178.350 Specification 7A; general packaging, Type A.

APPENDICES TO PART 178

- Appendix A—Specifications for Steel
- Appendix B—Specifications for Plastics

§ 178.0 Purpose, scope, and applicability.**§ 178.0-1 Purpose and scope.**

This Part prescribes the manufacturing and testing specifications for packaging and containers used for the transportation of hazardous materials.

§ 178.0-2 Applicability.

(a) Any person who performs a function prescribed in this Part, shall perform that function in accordance with this Part.

(b) When this Part requires (either expressly or by reference to § 173.24 of this subchapter) a packaging or container to be marked with a DOT specification (for example, DOT-1A, DOT-17E-304HT, DOT-23G40), compliance with that requirement is the responsibility of the packaging or container manufacturer. Marking the packaging or container with the DOT specification shall be understood to certify compliance by the manufacturer, that the functions performed by the manufacturer, as prescribed in this Part, have been performed in compliance with this Part. (See also § 173.28 "Reuse of containers." That section envisions the marking of containers to be performed by a person other than the original manufacturer.)

(c) Except as specifically provided in § 178.340, the manufacturer of a packaging or container should inform each person to whom that packaging or container is transferred of any specification requirements which have not been met at time of transfer.

Subpart A—Specifications for Carboys, Jugs in Tubs, and Rubber Drums**§ 178.1 Specification 1A; boxed carboys.**

Glass, earthenware, clay, or stoneware.

§ 178.1-1 Compliance.

(a) Required in all details.

§ 178.1-2 Reuse of packages.

(a) Parts of outside container and cushioning must be replaced when broken, decayed, or inefficient in any way.

(b) Carboys with lip cracked or badly chipped not authorized; gasket seat must

be even. Packages must be capable of passing tests prescribed in § 178.1-9.

§ 178.1-3 Closing devices required.

(a) As follows except when otherwise authorized in the packing regulations:

(1) Acidproof stoppers or other devices with gaskets, securely fastened; venting closures are required when necessary to prevent internal pressure in excess of 8 pounds per square inch gauge at 130° F.

(2) Glass stoppers around to fit and securely fastened are authorized when internal pressures do not exceed 8 pounds per square inch gauge at 130° F.

§ 178.1-4 Capacity and marking of carboy.

(a) Containers 5 to 13 gallons are classed as carboys. Must be embossed to indicate maker and year of manufacture; mark of maker to be registered with the Bureau of Explosives.

§ 178.1-5 Class carboys.

(a) Thoroughly annealed; top of lip smooth and even; must contain at least

20 pounds of glass of 12-gallon carboys and 21 pounds for 13-gallon carboys. Glass in side walls should be well distributed and at least $\frac{1}{16}$ " thick. Defective carboys not authorized.

§ 178.1-6 Earthenware, clay, or stone-ware carboys.

(a) Of acidproof material.

§ 178.1-7 Outside containers.

(a) Wooden boxes completely enclosing body of carboy or wooden boxes completely enclosing body and neck of carboy, with 4 vertical corner posts, two cleats for shoes and two carrying cleats. (See paragraph (e) of this section).

(b) Lumber to be well seasoned, commercially dry, and free from decay, loose knots, knots that would interfere with nailing, and other defects that would materially lessen the strength.

(c) Assemble sides and ends with grain of wood horizontal and nail as specified. Nail bottom to sides and ends; fasten top by any efficient means. Cleats for shoes to be along edges of bottom parallel to carrying cleats. (See paragraph (e) of this section).

(d) Parts and dimension as follows:

Nominal carboy capacity not over	Minimum dimensions			Nails—sides and bottom	
	Thickness sides, top, bottom and ends	¹ Vertical corner posts	¹ Carrying cleats and shoes	² Size not less than	³ Spacing average not over
Gallons	Inch $\frac{5}{8}$	Inches $\frac{5}{8} \times 2\frac{1}{2}$	Inches $\frac{5}{8} \times 1\frac{1}{8}$	Penny	Inches $2\frac{1}{4}$
5 to 7.....				7	2
from				6	
7 to 13.....	$2\frac{3}{32}$	$2\frac{3}{32} \times 3\frac{1}{8}$	$2\frac{3}{32} \times 2\frac{1}{32}$	9	$2\frac{3}{4}$
				8	$2\frac{1}{2}$

¹ Other dimensions with equal cross section acceptable.

² Screws of equal efficiency authorized.

³ Spacing 6 inches acceptable along edge grain of bottoms.

(e) In place of bottom cleats, the following is authorized: 2 angle irons at least $1\frac{1}{4}$ " x $1\frac{1}{4}$ " x $\frac{1}{16}$ ", applied across grain of bottom boards from corner to corner, supported by acid resistant metal corner supports securely fastened to sides and ends at each bottom corner so as to raise bottom boards of box at least $\frac{3}{4}$ " above bottom of corner supports; nailing along end grain of bottom boards not required.

(f) Special box. Must comply with this specification except as follows: Bottom of box must be nailed to 4 nailing cleats which form part of the sides and ends of box. Top of box must be reinforced by 2 cleats of $\frac{1}{2}$ -inch lumber 4 inches wide, extending the entire width of the top at right angles to the sides of the boards forming the top; a vacant space of 1 inch between outside edge of top and cleat should be allowed for nailing top to box; parts and dimensions must be as follows:

Carboy capacity, not over (gallons)	Minimum dimensions					Nails, sides, and bottom	
	Thickness of sides, top, and ends	Thickness of bottom	Thickness and width of bottom nailing cleats	Carrying cleats and shoes	Triangular vertical corner posts	Size not less than	Spacing average not over ²
5 to 13	Inch 1½	Inches 25/32	Inches 25/32 by 2½	Inches 25/32 by 2½	Inches 2½ by 2½ (short sides)	Penny 8 10	Inches 2½ 2½

¹ Screws of equal efficiency authorized.

² Spacing 6 inches acceptable along edge grain of bottoms.

(g) *Cushioning materials.* Cushioning devices or materials must be of such type, or be so secured within the outer container, that the carboy cannot shift in a way that cushioning efficiency is reduced.

§ 178.1-8 Marking of outside container.

(a) On each container with letters and figures at least ¾ inch high applied by hot branding iron or printing ink of a color sharply contrasting to background of package with high pressure dies as follows:

(1) DOT-1A.

(2) Name or symbol of person making the mark specified in paragraph (a) (1) of this section and located just above or below that mark. Symbol, if used, must be registered with the Bureau of Explosives.

§ 178.1-9 Tests.

(a) *Apparatus.* Standard required. Detail prints can be obtained from Bureau of Explosives.

(b) *Method.* Fill with water to lower edge of neck; swing 55° measured from wall to nearest bottom edge of basket:

(1) Side shock; test at least 10 carboys.

(2) Bottom shock; test at least 6 carboys.

NOTE 1: In instances where 99 or less carboys are in service during either 6-month period of the year it shall be acceptable to test 10 percent of the total but no less than 3 carboys on both the side and bottom swing. If this provision is used, the report of test results must so state.

(c) *Acceptable results.* 90 percent of carboys must not break under side shock and same for bottom shock, except both results must be 100 percent if modified test authorized by Note 1 of paragraph (b) of this section is used.

(d) When required. By each manufacturer, and each shipper who fills and ships new or used carboys; during each 6 months of each year; separate tests required for:

(1) New packages (those with new outside container).

(2) Used packages.

(3) Packages with carboys differing over 2 gallons.

(4) Packages differing in kind of cushioning.

(e) *Exception.* Tests not required by shipper who fills and ships or reships for one shipment only packages obtained from a manufacturer or shipper who has had tests made.

(f) Reports shall be retained on file by the manufacturer or shipper for 3 years.

§ 178.1-10 Approval of veneer, plywood and laminated wood boxes.

(a) Boxes of veneer, plywood, laminated wood, or any combination thereof, which comply with §§ 178.1-1 to 178.1-10 (except § 178.1-7 (a), (c), and (d)), are approved provided:

(1) Outside containers shall completely enclose body of carboy or body and neck of carboy.

(2) That complete inner packing and box specifications have been filed with and approved by the Bureau of Explosives.

(3) That these boxed carboys pass the regular tests prescribed in § 178.1-9.

(4) That boxed carboys after a minimum service period of 6 months pass the tests prescribed in § 178.1-9.

(5) That a detailed report of tests prescribed under paragraph (a) (4) of this section has been filed with and accepted as satisfactory by the Bureau of Explosives.

§ 178.2 Specification 1B; boxed lead carboys.

§ 178.2-1 Compliance.

(a) Required in all details.

§ 178.2-2 Reuse of packages.

(a) Parts of outside container and cushioning must be replaced when broken, decayed, or inefficient in any way.

(b) Tests, see § 178.2-7, required before each shipment.

§ 178.2-3 Closing.

(a) By stoppers securely fastened.

§ 178.2-4 Capacity, marking, and manufacture of carboy.

(a) *Capacity and marking of carboy.* Containers 5 to 13 gallons are classed as carboys. Must be permanently marked to indicate maker and year of manufacture; mark of maker to be registered with the Bureau of Explosives.

(b) *Manufacture of carboy.* Of pure-chemical or pure-electrolytic virgin lead; side and bottom sheets 8 pounds and top sheets 10 pounds per square foot minimum; all seams burned.

§ 178.2-5 Outside containers.

(a) Wooden box, completely enclosing body of carboy, with 4 vertical corner posts, 2 cleats for shoes, and 2 carrying cleats. Corner posts not required when ends are twice the specified thickness.

(b) Lumber to be well seasoned, commercially dry, and free from decay, loose knots, knots that would interfere with nailing, and other defects that would materially lessen the strength.

(c) Assemble sides and ends with grain of wood horizontal and nail as specified. Nail bottom to sides and ends; fasten top by any efficient means. Cleats for shoes to be along edges of bottom parallel to carrying cleats. (See paragraph (e) of this section.)

(d) Parts and dimensions as follows:

Carboy capacity, not over	Minimum dimensions			Nails—Sides and bottom	
	Thickness—Sides, top, bottom, and ends	Vertical corner posts ¹	Carrying cleats and shoes ¹	Size not less than ²	Spacing, average not over ³
Gallons	Inches	Inches	Inches	Penny	Inches
5 to 6..	$\frac{3}{8}$	$\frac{3}{8}$ x 2 $\frac{1}{2}$	$\frac{3}{8}$ x 1 $\frac{1}{2}$	7	2 $\frac{1}{4}$
7 to 13..	2 $\frac{3}{32}$	2 $\frac{3}{32}$ x 3 $\frac{1}{8}$	2 $\frac{3}{32}$ x 2 $\frac{1}{16}$	8	2 $\frac{1}{4}$

¹ Other dimensions with equal cross section acceptable.

² Screws of equal efficiency authorized.

³ Spacing 6 inches acceptable along edge grain of bottoms.

(e) In place of bottom cleats, the following is authorized: 2 angle irons at least 1 $\frac{1}{4}$ " x 1 $\frac{1}{4}$ " x $\frac{1}{16}$ ", applied across grain of bottom boards from corner to corner, supported by acid resistant metal corner supports securely fastened to sides and ends at each bottom corner so as to raise bottom boards of box at least $\frac{3}{4}$ " above bottom of corner supports; nailing along end grain of bottom boards not required.

§ 178.2-6 Marking of outside container.

(a) On each container with letters and figures at least $\frac{3}{4}$ inch high applied by hot branding iron or printing ink of a color sharply contrasting to background of package with high pressure dies as follows:

(1) DOT-1B.

(2) Name or symbol of person making the mark specified in paragraph (a) (1) of this section and located just above or below that mark. Symbol, if used, must be registered with the Bureau of Explosives.

§ 178.2-7 Tests.

(a) To 5 pounds per square inch internal pressure without leakage; required before each shipment.

§ 178.2-8 Approval of veneer, plywood and laminated wood boxes.

(a) Boxes of veneer, plywood, laminated wood, or any combination thereof, which comply with §§ 178.2-1 to 178.2-8 except § 178.2-5 (a), (c), and (d) are approved provided:

(1) Outside containers shall completely enclose body of carboy or body and neck of carboy.

(2) That complete inner packing and box specifications have been filed with and approved by the Bureau of Explosives.

(3) That these boxed carboys pass the regular tests prescribed in § 178.2-7.

(4) That boxed carboys after a minimum service period of 6 months pass the tests prescribed in § 178.2-7.

(5) That a detailed report of tests prescribed under subparagraph (4) of this paragraph has been filed with and accepted as satisfactory by the Bureau of Explosives.

§ 178.3 Specification 1C; carboys in kegs.

Glass, earthenware, clay or stoneware.

§ 178.3-1 Compliance.

(a) Required in all details.

§ 178.3-2 Reuse of packages.

(a) Parts of outside container and cushioning must be replaced when broken, decayed, or inefficient in any way.

(b) Carboys with lip cracked or badly chipped not authorized; gasket seat must be even. Packages must be capable of passing tests prescribed in § 178.3-9.

§ 178.3-3 Closing devices required.

(a) As follows except when otherwise authorized in the packing requirements:

(1) Acidproof stoppers or other devices, with gaskets, securely fastened; venting closures are required when necessary to prevent internal pressure in excess of 8 pounds per square inch gauge at 130° F.

(2) Glass stoppers ground to fit and securely fastened are authorized when internal pressures do not exceed 8 pounds per square inch gauge at 130° F.

§ 178.3-4 Capacity and marking of carboy.

(a) Containers 5 to 13 gallons are classed as carboys. Must be embossed to indicate maker and year of manufacture; mark of maker to be registered with the Bureau of Explosives.

§ 178.3-5 Glass carboys.

(a) Thoroughly annealed; top of lip smooth and even; must contain at least 20 pounds of glass for 12-gallon carboys and 21 pounds for 13-gallon carboys. Glass in side walls should be well distributed and at least $\frac{1}{16}$ " thick. Defective carboys not authorized.

§ 178.3-6 Earthenware, clay, or stoneware carboys.

(a) Earthenware, clay, or stoneware carboys of acidproof material.

§ 178.3-7 Manufacture of kegs.

(a) Manufacture of kegs as follows:

(1) *Staves and headings.* To be of white oak, chestnut oak, red oak, black cherry, or Douglas fir; quarter sawed with the grain, from straight-grained timber, so no annual ring shall slope over half the thickness of stave or head; thoroughly kiln dried, moisture content 7 percent to 11 percent; free from rotten sap, checks, pitch pockets, cat faces, and other defects that show through on both sides.

(2) *Hoops.* To be of cooperage-grade hoop steel.

(b) *Staves:* To be sawed evenly and circular; croze center to be within $1\frac{1}{8}$ " of end of stave; stave end to have $\frac{1}{8}$ " free from bevel.

(1) *Heading.* Of uniform thickness and properly circled; planed on outside and properly jointed and glued, or doweled and flagged; dowel diameter not over $\frac{5}{12}$ thickness of head.

(c) The keg: Stave joints reasonably flush on outside.

(d) Parts required and dimensions as follows:

(1) Staves, when finished on outside:

Capacity of container, not over	Maximum			Minimum	
	Length	Width	Bilge circle	Staves	Thickness
Gallons	Inches	Inches	Inches	Number	Inches
30.....	30	5	74	16	$\frac{5}{8}$
15.....	24	$4\frac{1}{2}$	54	14	$\frac{9}{16}$
10.....	22	$4\frac{1}{4}$	50	12	$\frac{1}{2}$
5.....	18	4	40	10	$\frac{1}{2}$

Foregoing thicknesses are of staves finished on one side. One-sixteenth inch must be added for unfinished staves.

Foregoing maximum lengths are authorized to be increased 6 percent or less, provided the thickness of stave is increased at least one-sixteenth inch for each increase of 1 inch in length or fraction thereof.

(2) *Heading, after planing:*

Capacity of container, not over	Maximum		Minimum	
	Pieces	Diameter	Thickness	Width
Gallons	Number	Inches	Inches	Inches
30.....	6	18	$\frac{5}{8}$	$2\frac{1}{2}$
15.....	5	14	$\frac{9}{16}$	2
10.....	5	13	$\frac{1}{2}$	2
5.....	4	11	$\frac{1}{2}$	2

(3) *Hoops, number and size:*

Capacity of container, not over (gallons)	Minimum number of hoops	Minimum size of hoops (inches in width and Birmingham gauge)							
		Head		First quarter		Second quarter		Bilge	
		Inch	Gauge	Inch	Gauge	Inch	Gauge	Inch	Gauge
30	6	$1\frac{1}{2}$	18	$1\frac{1}{4}$	19	.....	.....	$1\frac{1}{2}$	18
15	6	$1\frac{1}{4}$	19	$1\frac{1}{8}$	19	.....	.....	$1\frac{1}{4}$	19
10	6	$1\frac{1}{4}$	19	1	19	.....	.....	$1\frac{1}{4}$	19
5	6	1	19	1	19	.....	.....	1	19

(e) *Cushioning materials.* Cushioning devices or materials must be of such type, or be so secured within the outer container, that the carboy cannot shift in a way that cushioning efficiency is reduced.

§ 178.3-8 Marking of outside container.

(a) On each container with letters and figures at least $\frac{3}{4}$ inch high applied near the bilge by hot branding iron or printing ink of a color sharply contrasting to background of package with high pressure dies as follows:

(1) DOT-1C.

(2) Name or symbol of person making the mark specified in paragraph (a) (1) of this section and located just above or below that mark. Symbol, if used, must be registered with the Bureau of Explosives.

§ 178.3-9 Tests.

(a) *Apparatus.* Standard required. Detail prints can be obtained from Bureau of Explosives.

(b) *Method.* Fill with water to lower edge of neck; swing 55" measured from wall to nearest bottom edge of basket:

(1) Side shock; test at least 10 carboys.

(2) Bottom shock; test at least 5 carboys.

NOTE 1: In instances where 99 or less carboys are in service during either 6-month period of the year it shall be acceptable to test 10 percent of the total but not less than 3 carboys on both the side and bottom swing. If this provision is used, the report of test results must so state.

(c) *Acceptable results.* 90 percent of carboys must not break under side shock and same for bottom shock, except both results must be 100 percent if modified test authorized by Note 1 of paragraph (b) of this section is used.

(d) When required. By each manufacturer, and each shipper who fills and ships new or used carboys; during each 6 months of each year; separate tests required for:

(1) New packages (those with new outside container).

(2) Used packages.

(3) Packages with carboys differing over 2 gallons.

(4) Packaging differing in kind of cushioning.

(e) *Exception.* Tests not required by shipper who fills and ships or reships for one shipment only packages obtained from a manufacturer or shipper who has had tests made.

(f) Reports shall be retained on file by the manufacturer or shipper for 3 years.

§ 178.4 Specification 1D; boxed glass carboys.

§ 178.4-1 Compliance.

(a) Required in all details.

§ 178.4-2 Reuse of packages.

(a) Parts of outside container and cushioning must be replaced when broken, decayed, or inefficient in any way.

(b) Carboys with lip cracked or badly chipped not authorized; gasket seat must be even. Packages must be capable of passing tests prescribed in § 178.4-8.

§ 178.4-3 Closure.

(a) Threaded screw cap which shall be constructed of a suitable plastic or other material resistant to lading.

(b) Gasket or lining for cap must be used and shall be resistant to lading and:

(1) Must be liquid tight or;
(2) Must be liquid tight up to venting pressure when such venting is prescribed for the material which is to be shipped.

(c) At least one complete continuous thread must be engaged with gasket in place.

§ 178.4-4 Capacity and marking of carboy.

(a) *Capacity.* 6.5 United States gallons nominal capacity, 7.0 United States gallons overflow, tolerance plus or minus 10 fluid ounces.

(b) *Marking.* Each carboy bottle must be embossed in bottom as follows:

Maker's mark (to be registered with Bureau of Explosives)
Year of Manufacture
DOD-1D

§ 178.4-5 Glass carboy bottle.

(a) Must be machine-blown, thoroughly and properly annealed, with screw thread finish having at least one continuous thread to accommodate closure; top of lip smooth and even; must contain 14 pounds of glass, tolerance minus 8 ounces plus 16 ounces. Minimum thickness to be .075 inch. Defective carboys not authorized.

§ 178.4-6 Outside containers.

(a) Wooden boxes completely enclosing body and neck of carboy, with 4 vertical corner posts, two cleats for shoes and two carrying cleats. An opening not exceeding 3 inches in width may be provided directly above the neck of bottle, if the top of the box is made up of not more than two pieces of lumber of $2\frac{3}{4}$ inch thickness. Bottom board of the two

ends of the box must be constructed of lumber at least one inch thick, must be flush with the carrying cleats and be at least $2\frac{3}{4}$ inches in width. Cleats or other fasteners used to secure cover must not extend beyond carrying cleats.

(b) Lumber to be well seasoned commercially dry, and free from decay, loose knots, knots that would interfere with nailing, and other defects that would materially lessen the strength.

(c) Assemble sides and ends with grain of wood horizontal and nail as specified. Nail bottom to sides and ends; fasten top by any efficient means (friction closure not authorized). Cleats for shoes to be along edges of bottom parallel to carrying cleats and at right angle to the direction of bottom board or boards.

(d) Parts and dimensions as follows:

Carboy capacity, nominal not over (gallons)	Minimum dimensions			Nails—Sides and bottom ¹	
	Thickness—Sides, top, bottom, and ends ¹	Vertical corner posts ¹	Carrying cleats and shoes ¹	Size	Spacing, average ²
6.5.....	Inch $\frac{1}{2}$	Square Inches 2.0	Inches $1\frac{1}{2} \times 2\frac{1}{4}$	Penny 6	Inches 2

¹ Except as prescribed or permitted under § 178.4-6(a).
² Cross sectional area.

³ Other dimensions with equal cross section acceptable, in lieu of separate carrying cleats, side board, at point where cleat should be located, may be constructed of lumber not less than one inch thick so that overhang will be at least $\frac{1}{2}$ inch.

⁴ Screws of equal efficiency authorized.

⁵ Spacing 6 inches acceptable along edge grain of bottoms.

(e) *Cushioning materials.* Cushioning devices or materials must be of such type, or be so secured within the outer container, that the carboy cannot shift in a way that cushioning efficiency is reduced.

§ 178.4-7 Marking of outside container.

(a) On each container with letters and figures at least $\frac{3}{4}$ inch high applied by hot branding iron or printing ink of a color sharply contrasting to background of package with high pressure dies as follows:

(1) DOT-1D.

(2) Name or symbol of person making the mark specified in paragraph (a) (1)

of this section and located just above or below that mark. Symbol, if used, must be registered with the Bureau of Explosives.

§ 178.4-8 Tests.

(a) *Apparatus.* Standard required. Detail prints can be obtained from Bureau of Explosives.

(b) *Method.* Fill with water to lower edge of neck; swing 55" measured from wall to nearest bottom edge of basket:

(1) Side shock; test at least 10 carboys.

(2) Bottom shock, test at least 5 carboys.

NOTE 1: In instances where 99 or less carboys are in service during either 6-month period of the year it shall be acceptable to test 10 percent of the total but not less than 3 carboys on both the side and bottom swing. If this provision is used, the report of test results must so state.

(c) *Acceptable results.* 90 percent of carboys must not break under side shock and same for bottom shock, except both results must be 100 percent if modified test authorized by Note 1 of paragraph (b) of this section is used.

(d) When required. By each manufacturer, and each shipper who fills and ships new or used carboys; during each 6 months of each year; separate tests required for:

(1) New packages (those with new outside container).

(2) Used packages.

(3) Packages differing in kind of cushioning.

(e) *Exception.* Tests not required by shipper who fills and ships or reships for one shipment only packages obtained from a manufacturer or shipper who has had tests made.

(f) Reports shall be retained on file by the manufacturer or shipper for 3 years.

(g) *Internal pressure test.* Bottles shall be capable of withstanding a sustained internal pressure of 20 p.s.i. gauge for a 15-day period. Bottle manufacturer shall demonstrate that bottles of a proposed design will meet this test prior to start of production.

(h) *Hydrostatic pressure test.* One bottle selected at random from each 200 produced on each mold shall be subjected to an instantaneous hydrostatic pressure test to bursting. Pressure at which bottle bursts must not be less than 40 p. s. i. gauge. If bottle so tested fails at a pressure less than 40 p. s. i., 12 additional samples must be selected from the same lot of 200 bottles and tested in the same manner. All 12 samples must pass required test otherwise entire lot shall be rejected.

§ 178.5 Specification 1X; boxed carboys, 5 to 6½ gallons, for export only.

Glass, earthenware, clay, or stoneware. Single-trip container.

§ 178.5-1 Compliance.

- (a) Required in all details.

§ 178.5-2 Closing devices required.

- (a) As follows except when otherwise authorized in the packing regulations:

(1) Acidproof stoppers or other devices, with gaskets, securely fastened; venting closures are required when necessary to prevent internal pressure in excess of 8 pounds per square inch gauge at 130° F.

(2) Glass stoppers ground to fit and securely fastened are authorized when internal pressures do not exceed 8 pounds per square inch gauge at 130° F.

(3) For box: Two flat metal nailless straps, at least $\frac{3}{4}$ inch by 0.020 inch, encircling top, sides, and bottom and securely sealed, are required.

§ 178.5-3 Capacity and marking of carboy.

- (a) Containers must be 5 to 6½ gallon size and embossed to indicate maker and year of manufacture.

§ 178.5-4 Glass carboys.

- (a) Thoroughly annealed; top of lip smooth and even. Glass in side walls should be well distributed and at least $\frac{1}{16}$ inch thick. Defective carboys not authorized.

§ 178.5-5 Earthenware, clay, or stoneware carboys.

- (a) Earthenware, clay, or stoneware carboys of acidproof material.

§ 178.5-6 Outside containers.

- (a) Wooden boxes completely enclosing body and neck of carboy, with 4 vertical corner posts. Top may consist of cap fitting snugly inside body of box and resting on corner posts.

(b) Lumber to be well seasoned, commercially dry, and free from decay, loose knots, knots that would interfere with nailing, and other defects that would materially lessen the strength.

(c) Assemble sides and ends with grain of wood horizontal and nail as specified; nail bottom to ends; fasten top by any efficient means.

(d) Parts and dimensions. Sides, top, and bottom at least $\frac{1}{2}$ inch thick; vertical corner posts at least 2.25 square inches cross section; nails at least 6-penny at 2-inch intervals or 5-penny at 1¾-inch intervals.

(e) *Cushioning materials.* Cushioning devices or materials must be of such type, or be so secured within the outer container, that the carboy cannot shift in a way that cushioning efficiency is reduced.

§ 178.5-7 Marking of outside container.

- (a) On each container with letters and figures at least $\frac{3}{4}$ inch high applied by hot branding iron or printing ink of a color sharply contrasting to background of package with high pressure dies as follows:

(1) DOT-1X.

(2) Name or symbol of person making the mark specified in paragraph (a) (1) of this section and located just above or below that mark. Symbol, if used, must be registered with the Bureau of Explosives.

§ 178.5-8 Marking.

- (a) Each outside container must also be plainly marked "FOR EXPORT ONLY, NOT RETURNABLE" and the top must be marked "THIS SIDE UP".

§ 178.5-9 Tests.

- (a) *Apparatus.* Standard required. Detail prints can be obtained from Bureau of Explosives.

(b) *Method.* Fill with water to lower edge of neck; swing 55" measured from wall to nearest bottom edge of basket:

(1) Side shock; test at least 10 carboys.

(2) Bottom shock; test at least 5 carboys.

(c) *Acceptable results.* 90 percent of carboys must not break under side shock; same for bottom shock.

(d) When required. By each manufacturer, and each shipper who fills and ships new carboys; during each 6 months of each year; separate tests required for:

(1) New packages (those with new outside container).

(2) Packages differing in kind of cushioning.

(e) *Exception.* Tests not required by shipper who fills and ships or reships for one shipment only packages obtained from a manufacturer or shipper who has had tests made.

(f) Reports shall be retained on file by the manufacturer or shipper for 3 years.

§ 178.6 Specification 1EX; glass carboys in plywood drums.

Single trip container.

§ 178.6-1 Compliance.

(a) Required in all details.

§ 178.6-2 Lumber.

(a) To be well seasoned, commercially dry, and free from decay, loose knots, knots that would interfere with nailing, and other defects that would materially lessen the strength.

§ 178.6-3. Closing devices required.

(a) As follows except when otherwise authorized in the packing regulations:

(1) Acidproof stoppers or other devices, with gaskets, securely fastened; venting closures are required when necessary to prevent internal pressure in excess of 8 pounds per square inch gauge at 130° F.

(2) Glass stoppers ground to fit and securely fastened are authorized when internal pressures do not exceed 8 pounds per square inch gauge at 130° F.

§ 178.6-4 Capacity and marking of carboy.

(a) Containers must be 5 to 6½ gallons capacity and embossed to indicate maker and year of manufacture.

§ 178.6-5 Glass carboys.

(a) Thoroughly annealed; top of lip smooth and even. Glass in side walls should be well distributed and at least $\frac{1}{16}$ inch thick. Defective carboys not authorized.

§ 178.6-6 Outside containers.

(a) Plywood drums completely enclosing body and neck of carboy and constructed as follows:

(1) *Body shell.* To be of two plies of hardwood veneer, each not less than $\frac{1}{12}$ inch in thickness, firmly glued together, with the grain of the outside ply parallel and the inner ply vertical to the heads. The body shall be butt-jointed and shall be fastened on the outside with a 28-gauge steel strip, not less than $1\frac{1}{2}$ inches in width. 17-gauge staples shall be driven on each side of the joint, spaced not more than $1\frac{1}{2}$ inches apart and clinched on inside of the body.

(2) *Heads.* Top and bottom heads shall be of three ply hardwood veneer, each ply not less than $\frac{1}{12}$ inch in thickness, all firmly glued together, with the grain of each outer ply at right angles to the grain of the center ply. Each head shall be circled to fit snugly inside of the body. Interior heads shall be of the same construction.

(3) *Hoops.* To be of hardwood veneer, not less than $1\frac{3}{4}$ inches wide by $\frac{1}{8}$ inch thick. Hoops shall be fastened to the body by 17-gauge staples on not less than 3 inch centers and shall be overlapped not less than 3 inches.

(4) *Head liners.* When plywood cushioning is used the inner lining strips which support the plywood cushion shall be of hardwood veneer not less than $\frac{1}{8}$ inch in thickness and $\frac{3}{4}$ inch in width and shall butt or slightly gap. All other head lining strips shall be made of hardwood veneer not less than $\frac{1}{8}$ inch in thickness and $\frac{3}{4}$ inch in width and shall overlap not less than 3 inches. The bottom head liner and the inside liner strips for the false head and support of the top head shall be fastened by 17-gauge staples on not less than 3 inch centers. The staples shall be driven through the outer hoop and body and clinched on the inside of the veneer strips; except that the strips holding the false head shall have staples only through the body shell and liner. The top liner which forms the final closure shall be fastened to the body by 14-gauge staples driven through the head liner and body into the outer hoop on not less than 4 inch centers.

(5) *Battens.* A $\frac{5}{8}$ inch by 2 inch batten shall be applied to top and bottom and shall be secured at each end by two nails driven through the hoops and shell.

(b) *Cushioning materials.* Cushioning devices or materials must be of such type, or be so secured within the outer container, that the carboy cannot shift in a way that cushioning efficiency is reduced.

§ 178.6-7 Approval.

(a) The complete inner packing and drum specification must be filed with and approved by the Bureau of Explosives.

§ 178.6-8 Marking of outside container for compliance with specification.

(a) On each container with letters and figures at least $\frac{3}{4}$ inch high applied by hot branding iron or printing ink of a color sharply contrasting to background of package with high pressure dies as follows:

(1) DOT-1EX.

(2) Name or symbol of person making the mark specified in paragraph (a) (1) of this section and located just above or below that mark. Symbol, if used, must be registered with the Bureau of Explosives.

§ 178.6-9 Marking of outside container for use.

(a) Each outside container must also be plainly marked "SINGLE-TRIP CONTAINER" just above or below the mark specified in § 178.6-8(a) (1) of this part.

§ 178.6-10 Tests.

(a) *Apparatus.* Standard required. Detail prints can be obtained from Bureau of Explosives.

(b) *Method.* Fill with water to lower edge of neck; swing 55" measured from wall to nearest bottom edge of basket:

(1) Side shock; test at least 10 carboys.

(2) Bottom shock; test at least 5 carboys.

NOTE 1: In instances where 99 or less carboys are in service during either 6-month period of the year it shall be acceptable to test 10 percent of the total but not less than 3 carboys on both the side and bottom swing. If this provision is used, the report of test results must so state.

(c) *Acceptable results.* 90 percent of carboys must not break under side shock and same for bottom shock, except both results must be 100 percent if modified test authorized by Note 1 of paragraph (b) of this section is used.

(d) When required. By each manufacturer, and each shipper who fills and ships new carboys; during each 6 months of each year; separate tests required for:

(1) New packages (those with new outside containers).

(2) Packages differing in kind of cushioning.

(e) *Exception.* Tests not required by shipper who fills and ships or reships for one shipment only packages obtained from a manufacturer or shipper who has had tests made.

(f) Reports shall be retained on file by the manufacturer or shipper for 3 years.

§ 178.7 Specification 1E; glass carboys in plywood drums.

§ 178.7-1 Compliance.

(a) Required in all details.

§ 178.7-2 Reuse of packages.

(a) Outside container, including metal side seam, must be replaced when broken, decayed, or inefficient in any way.

(b) Carboys with lip cracked or badly chipped not authorized; gasket seat must be even. Packages must be capable of passing tests prescribed in § 178.7-8.

§ 178.7-3 Capacity and marking of carboy.

(a) Glass containers 5 to 7 gallons in this specification are classed as carboys. Must be embossed to indicate maker and year of manufacture; mark of maker to be registered with the Bureau of Explosives.

§ 178.7-4 Glass carboys.

(a) Thoroughly annealed; top of lip smooth and even. Glass in side walls should be well distributed and at least $\frac{1}{16}$ inch thick. Defective carboys not authorized.

(b) *Closing devices required.* (For carboys without screw thread finish.) As follows except when otherwise authorized in the packing regulations.

(1) Acidproof stoppers or other devices, with gaskets, securely fastened; venting closures are required when necessary to prevent internal pressure in excess of 8 pounds per square inch gauge at 130° F.

(2) Glass stoppers ground to fit and securely fastened are authorized when internal pressures do not exceed 8 pounds per square inch gauge at 130° F.

§ 178.7-5 Glass carboy bottle.

(a) (Threaded screw-cap closure only.) Must be machine-blown, thor-

oughly and properly annealed, with screw thread finish having at least one continuous thread to accommodate closure; top of lip smooth and even; must contain 14 pounds of glass, tolerance minus 8 ounces plus 16 ounces. Minimum thickness to be 0.075 inch. Defective carboys not authorized.

(b) *Closure.* (1) Threaded screw cap which shall be constructed of a suitable plastic or other material resistant to lading.

(2) Gasket or lining for cap must be used and shall be resistant to lading and must be liquid tight; or must be liquid tight up to venting pressure when such venting is prescribed for the material which is to be shipped.

(3) At least one complete continuous thread must be engaged with gasket in place.

§ 178.7-6 Outside containers.

(a) Plywood drums completely enclosing body of carboy or completely enclosing body and neck of carboy and constructed as follows:

(1) *Lumber.* To be well seasoned, commercially dry, and free from decay, loose knots, knots that would interfere with nailing, and other defects that would materially lessen the strength.

(2) *Body shell.* To be of two plies of good commercial box or sheathing grade hardwood veneer, each not less than $\frac{1}{4}$ inch in thickness, firmly glued together with waterproof glue (a section of plywood from body shell is immersed in water at room temperature for 48 hours. If no delamination or separation of plies is apparent, the glue is deemed to be waterproof) with the grain of the outside ply parallel and the inner ply vertical to the heads. The body shall be butt-jointed and shall be fastened on the outside with a 28-gauge steel strip, not less than $1\frac{1}{2}$ inches in width. Staples of

17-gauge shall be driven on each side of the joint, spaced not more than $1\frac{1}{2}$ inches apart and clinched on inside of the body.

(3) *Heads.* To be of three plies of good commercial box or sheathing grade hardwood veneer, each not less than $\frac{1}{10}$ inch in thickness, firmly glued together with waterproof glue (a section of plywood from head is immersed in water at room temperature for 48 hours; if no delamination or separation of plies is apparent, the glue is deemed to be waterproof), with the grain of each outer ply at right angles to the grain of the center ply. Each head shall be circled to fit snugly inside of the body. Interior heads shall be of the same construction.

(4) *Hoops.* To be of hardwood veneer, not less than $1\frac{3}{4}$ inches wide by $\frac{1}{4}$ inch thick. Hoops shall be fastened to the body by 17-gauge staples on not less than 3-inch centers and shall be overlapped not less than 3 inches.

(5) *Head liners. (Plywood drum completely enclosing body of carboy).* When plywood cushioning is used the inner lining strips which support the plywood cushion shall be of hardwood veneer not less than $\frac{1}{8}$ inch in thickness and $\frac{5}{8}$ inch in width and shall butt or slightly gap. All other head lining strips shall be made of hardwood veneer not less than $\frac{1}{8}$ inch in thickness and $\frac{5}{8}$ inch in width and shall overlap not less than 3 inches. The top head liners shall be fastened by 17-gauge staples on not less than 3-inch centers. The staples shall be driven through the outer hoop and body and clinched on the inside of the veneer strips. The bottom head liners shall be fastened the same as top head liners, or, by 14-gauge staples driven through the head liner and body into the outer hoop on not less than 4-inch centers.

(6) *Head liners. (Plywood drum completely enclosing body and neck of carboy).* When plywood cushioning is used the inner lining strips which support the plywood cushion shall be of hardwood veneer not less than $\frac{1}{8}$ inch in thickness and $\frac{5}{8}$ inch in width and shall butt or slightly gap. All other head lining strips shall be made of hardwood veneer not less than $\frac{1}{8}$ inch in thickness and $\frac{5}{8}$ inch in width and shall overlap not less than 3 inches. The inside head liners and the inside liner strips for the false head and support of the top head shall be fastened by 17-gauge staples on not less than 3-inch centers. The staples shall be driven through the outer hoop and

body and clinched on the inside of the veneer strips, except that the strips holding the false head shall have staples only through the body and shell liner. The top head liner which forms the final closure shall be fastened to the body by 14-gauge staples driven through the head liner and body into the outer hoop on not less than 4-inch centers. The bottom head liners shall be fastened the same as top head liners, or, by 17-gauge staples driven through the outer hoop and body and clinched on the inside of the veneer strips on not less than 3-inch centers.

(7) *Battens.* At least $\frac{3}{4}$ inch by 2 inches secured at each end by two nails driven through the hoops and body shell. One batten must be applied to the bottom of plywood drums, completely enclosing the body of carboys; and two battens must be applied to plywood drums completely enclosing the body and neck of carboys, one of which must be affixed to the top and the other to the bottom of the drum.

(b) *Cushioning materials.* Cushioning devices or materials must be of such type, or be so secured within the outer container, that the carboy cannot shift in a way that cushioning efficiency is reduced.

§ 178.7-7 Marking of outside container.

(a) On each container with letters and figures at least $\frac{3}{4}$ inch high applied by hot branding iron or printing ink of a color sharply contrasting to background of package with high pressure dies as follows:

(1) DOT-1E.

(2) Name or symbol of person making the mark specified in paragraph (a) (1) of this section and located just above or below that mark. Symbol, if used, must be registered with the Bureau of Explosives.

§ 178.7-8 Tests.

(a) *Apparatus.* Standard required. Detail prints can be obtained from Bureau of Explosives.

(b) *Method.* Fill with water to lower edge of neck; swing 55 inches measured from wall to nearest bottom edge of basket;

(1) Side shock; test at least 10 carboys.

(2) Bottom shock; test at least 5 carboys.

NOTE 1: In instances where 99 or less carboys are in service during either 6-month period of the year it shall be acceptable to test 10 percent of the total but not less than 8 carboys on both the side and bottom swing. If this provision is used, the report of test results must so state.

(c) *Acceptable results.* 90 percent of carboys must not break under side shock and same for bottom shock, except both results must be 100 percent if modified test authorized by Note 1 of paragraph (b) of this section is used.

(d) When required. By each manufacturer, and each shipper who fills and ships new or used carboys; during each 6 months of each year; separate tests required for:

(1) New packages (those with new outside container).

(2) Used packages.

(3) Packages with carboys differing over 2 gallons.

(4) Packages differing in kind of cushioning.

(e) *Exception.* Tests not required by shipper who fills and ships or reships for one shipment only packages obtained from a manufacturer or shipper who has had tests made.

(f) Reports shall be retained on file by the manufacturer or shipper for 3 years.

§ 178.8 Specification 28: metal-jacketed lead carboys.

§ 178.8-1 Compliance.

(a) Required in all details.

§ 178.8-2 Size.

(a) Not over 15 gallons (nominal).

§ 178.8-3 Test.

(a) By 5 pounds internal pressure, without leakage, before each shipment.

§ 178.8-4 Parts required and dimensions.

(a) As in §§ 178.8-5 to 178.8-8.

§ 178.8-5 Carboy closing device.

(a) To consist of follower-ring with stud bolts, plate-gasket, and cap as shown in § 178.8-8.

(b) Follower-ring to be 1½" wide with machined top face, inner edges rounded off to about ¼" radius, and fitted with 4 stud bolts, fastened to prevent turning, for 2" neck and 6 bolts for larger necks.

(c) Neck of carboy to be flanged over to edge of follower-ring and may be swedged out under it; inside diameter of neck not over 4".

§ 178.8-6 Outside container.

(a) Welding authorized in place of rivets shown; body rivets, if used, to be countersunk on inside.

(b) Bayonet fastenings, or other efficient method, authorized to secure top to body in place of bolts shown.

(c) Two adequate lifting handles required on body.

(d) Projections above level of top edge of body not authorized.

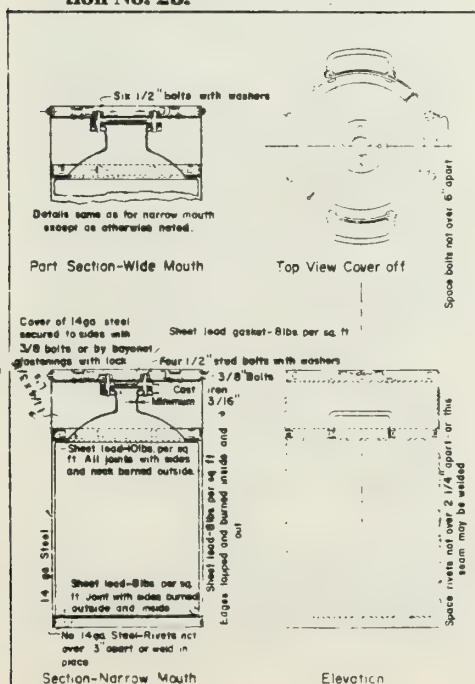
§ 178.8-7 Marking on each outside container.

(a) By embossing on top with raised marks $\frac{3}{4}$ " high as follows (stamping authorized if clearly legible):

(1) DOT-28A.

(2) Name or symbol of person making the mark specified in paragraph (a) (1) of this section and located just above or below that mark. Symbol, if used, must be registered with the Bureau of Explosives.

§ 178.8-8 Shipping container specification No. 28.



§ 178.9 Specification 28A; metal-jacketed lead carboys.

§ 178.9-1 Compliance.

(a) Required in all details.

§ 178.9-2 Size.

(a) Not over 15 gallons (nominal).

§ 178.9-3 Test.

(a) By 5 pounds internal pressure without leakage, before each shipment.

§ 178.9-4 Parts required and dimensions.

(a) As in §§ 178.9-5 to 178.9-8.

§ 178.9-5 Carboy closing device.

(a) To consist of follower-ring with stud bolts, plate-gasket, and cap as shown.

(b) Follower-ring to be $1\frac{1}{2}$ " wide with machined top face, inner edges rounded off to about $\frac{1}{4}$ " radius, and fitted with 4 stud bolts, fastened to prevent turning, for 2" neck and 6 bolts for larger necks.

(c) Neck of carboy to be flanged over to edge of follower-ring and may be swedged out under it; inside diameter of neck not over 8".

§ 178.9-6 Outside container.

(a) Welding authorized in place of rivets shown; body rivets, if used, to be countersunk on inside.

(b) Bayonet fastenings, or other efficient method, authorized to secure top to body in place of bolts shown.

(c) Two adequate lifting handles required on body.

(d) Projections above level of top edge of body not authorized.

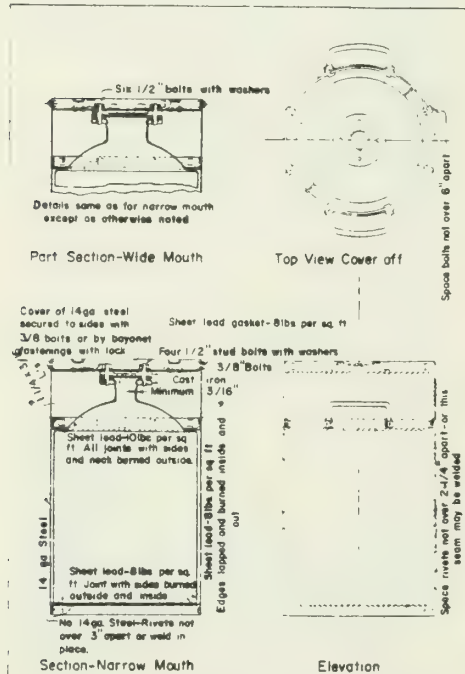
§ 178.9-7 Marking on each outside container.

(a) By embossing on top with raised marks $\frac{3}{4}$ " high as follows (stamping authorized if clearly legible):

(1) DOT-28.

(2) Name or symbol of person making the mark specified in paragraph (a) (1) of this section and located just above or below that mark. Symbol, if used, must be registered with the Bureau of Explosives.

§ 178.9-8 Shipping container specification No. 28A.



§ 178.12 Specification 34B; aluminum carboys.

§ 178.12-1 Compliance.

(a) Required in all details.

§ 178.12-2 Rated capacity.

(a) As marked, see § 178.12-9: 5 to 15 gallons; actual capacity shall be rated capacity plus at least 2 percent.

§ 178.12-3 Composition.

(a) Body and heads of aluminum at least 99 percent pure, or an aluminum base alloy of equivalent corrosion resistance and physical properties.

§ 178.12-4 Outage.

(a) Two percent of rated capacity, plus a maximum tolerance of 1 quart.

§ 178.12-5 Seams.

(a) Welded, including attachment of handles and other devices. Circumferential seams at least 3" from bottom.

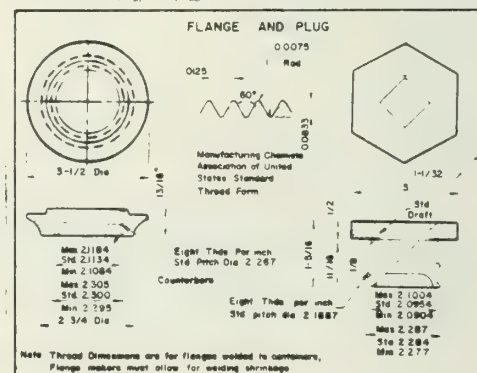
§ 178.12-6 Parts and dimensions.

(a) Thickness of material at least 0.110"; handles required.

§ 178.12-7 Closures.

(a) Adequate to prevent leakage; openings over 2.3" not authorized; suitable gaskets required.

(b) When threaded plugs, or caps, are used, they must be close fitting with gasket surfaces which bear squarely on each other when without gasket; they must have not over 8 threads per inch, with 5 complete threads engaged when gasket is in place, or not over 4 threads per inch, with 2 complete threads similarly engaged. Thread form must conform with the following drawing:



§ 178.12-8 Projections.

(a) Closing devices and other parts must be able to withstand tests prescribed in § 178.12-11.

§ 178.12-9 Marking on each container.

(a) On top by stamping with pressure dies, by embossing with raised marks, or plate attached by welding, as follows:

(1) DOT-34B.

(2) Name or symbol of person making the mark specified in paragraph (a) (1) of this section and located just above or below that mark. Symbol, if used, must be registered with the Bureau of Explosives.

(3) Nominal thickness of metal in decimals of an inch of the thinnest part; rated capacity in gallons; year of manufacture (for example, 0.110-15-50).

§ 178.12-10 Size of marking.

(a) Size of marking (minimum): 1/2" high.

§ 178.12-11 Type tests.

(a) Samples, taken at random and closed as for use, shall withstand prescribed tests without leakage except that

leakage through closure shall not constitute failure. Tests to be made by each company starting production and to be repeated every four months. Samples last tested to be retained until further tests are made. The type tests are as follows:

(1) Test by dropping, filled with water to 98 percent capacity, from height of 4 feet onto solid concrete so as to strike on bottom edge or circumferential seam.

(2) Hydrostatic pressure test of 40 pounds per square inch sustained for 5 minutes.

§ 178.12-12 Leakage test.

(a) Each container shall be tested, with seams under water or covered with soapsuds or heavy oil, by interior pressure of at least 10 pounds per square inch. Leakers shall be rejected or repaired and retested.

§ 178.13 Specification 1H; polyethylene carboys in low carbon steel or other equally efficient metal crates.

§ 178.13-1 Compliance.

(a) Required in all details.

§ 178.13-2 Capacity and marking of carboy.

(a) Containers 5 to 13 gallons capacity are classed as carboys. Actual capacity must be marked capacity plus 5 percent minimum. Must be permanently marked to indicate marked capacity, maker (symbols, if used, must be registered with the Bureau of Explosives), month and year of manufacture, and DOT-2T in figures and letters at least $\frac{1}{4}$ inch high.

§ 178.13-3 Polyethylene carboys.

(a) Carboys shall be made of polyethylene with no plasticisers or additives and have a maximum melt index value of 2.5 grams per 10 minutes as determined in accordance with method acceptable to the Bureau of Explosives. Carboys must have a minimum weight and wall thickness in accordance with the following table:

Marked capacity	Minimum wall thickness	Minimum weight of bottles
<i>Gallons</i>	<i>Inch</i>	<i>Pounds</i>
5	$\frac{3}{16}$	3
6	$\frac{3}{16}$	4
13	$\frac{3}{16}$	8

(b) Closing device shall be of material resistant to the lading and adequate to

prevent leakage. Opening for closure shall not be over $3\frac{1}{2}$ inches in diameter.

(c) Polyethylene carboys, as manufactured and filled to marked capacity with a material which remains in a liquid form, shall be capable of withstanding a 4-foot drop without leakage, after prior conditioning so that contents will be 0° Fahr. or colder, onto solid concrete on any portion of the carboy.

§ 178.13-4 Outside containers.

(a) Metal crates:

(1) Specifications for each size outside container must be filed by each plant prior to start of production and approved by the Bureau of Explosives.

§ 178.13-5 Marking of outside container.

(a) Each outside container must be plainly marked by attachment of a metal plate, or permanent marking in contrasting color directly on the polyethylene carboy in a visible area. Marking must be in letters and figures at least $\frac{3}{4}$ inch high and must be by embossing or stamping when applied on metal plates. Marking must be as follows:

(1) DOT-1H.

(2) Name or symbol of person making the mark specified in paragraph (a) (1) of this section and located just above or below that mark. Symbol, if used, must be registered with the Bureau of Explosives.

§ 178.13-6 Tests.

(a) One sample, taken at random and with inner container filled to marked capacity with water and closed as for use, shall be capable of withstanding prescribed tests without leakage or serious rupture of outer container. Tests shall be made of each size by each company starting production. The type tests are as follows:

(1) Complete package must be capable of withstanding 2 drops from a height of 4 feet onto solid concrete, the first drop to be made diagonally so top corner will strike the concrete; the second drop onto a 2-inch by 6-inch timber resting on the concrete with the 6-inch leg vertical, the drop being made with the package in a horizontal position and at right angles to the timber so that impact is near the center of the crate side-wall members.

§ 178.14 Specification 1K: glass carboys cushioned with expandable polystyrene in wooden wirebound box outside containers.

§ 178.14-1 Reuse of packages.

(a) Top, base or side sections of outside contained and cushioning must be replaced when broken, decayed, or inefficient in any way.

(b) Carboys with lip cracked or badly chipped not authorized; gasket seat must be even. Packages must be capable of passing tests prescribed in § 178.14-8.

§ 178.14-2 Closing devices required.

(a) As follows except when otherwise authorized in the packing regulations:

(1) Acidproof stoppers or other devices, with gaskets, securely fastened; venting closures are required when necessary to prevent internal pressure in excess of 8 pounds per square inch gauge at 130° F.

(2) Glass stoppers ground to fit and securely fastened are authorized when internal pressures do not exceed 8 pounds per square inch gauge at 130° F.

(b) For carboys with threaded closure finishes the threaded cap shall be constructed of a suitable plastic or other material resistant to lading.

(1) Gasket or lining must be used and shall be resistant to lading.

(2) Cap must be liquid tight or;

(3) Must be liquid tight up to venting pressure when such venting pressure is prescribed for the material to be shipped.

(4) At least one complete continuous thread must be engaged with gasket in place.

§ 178.14-3 Capacity and marking of carboy.

(a) Containers 5 to 13 gallons are classed as carboys; must be embossed to indicate maker and year of manufacture; mark of maker to be registered with the Bureau of Explosives.

[Order 66, 30 FR 5748, Apr. 23, 1965]

§ 178.14-4 Bottles.

(a) 13-gallon carboys. Must be thoroughly annealed; top of lip smooth and even; must contain at least 21 pounds of glass. Glass in sidewalls should be well distributed and at least $\frac{1}{16}$ inch thick.

(b) 6 $\frac{1}{2}$ -gallon carboys. Must be machine-blown, thoroughly and properly

annealed, with screw thread finish having at least one continuous thread to accommodate closure; top of lip smooth and even; must contain 14 pounds of glass, tolerance minus 8 ounces plus 16 ounces. Minimum thickness to be 0.075 inch. Defective carboys not authorized.

§ 178.14-5 Cushions.

(a) Expandable polystyrene, molded to produce a completely fused closed cell structure and designed as to provide a snug fit in all areas of contact with the inside container, in the following forms:

(1) Formed in place around the inside container; density 1.25 plus or minus 0.25 pounds per cubic foot, minimum thickness of sidewalls 1 inch and of bottoms 1.5 inches.

(2) Preformed cushions, one top and one bottom; density 2.75 plus or minus 0.5 pounds per cubic foot, minimum thickness of sidewalls 1 inch and of bottoms 1.37 inches.

(b) Assembled containers must be capable of passing tests prescribed in § 178.14-8.

§ 178.14-6 Outside containers.

(a) Wooden wirebound boxes completely enclosing body of carboy or completely enclosing body and neck of carboy.

(b) Lumber shall be as follows:

(1) Lumber shall be well seasoned and commercially dry; free from decay, objectionable knots, slanting shakes, sharp cross grain, and other defects that materially lessen the strength. Grain of wood in cleats and battens must not cross piece within its length.

(2) Authorized tolerances; cleats, battens and handles, minus $\frac{1}{32}$ inch; single thickness veneer minus 5 percent; resawn boards, $\frac{1}{32}$ inch below specified thickness for boards $\frac{1}{4}$ inch or more thick.

(3) Woods authorized are in the following groups:

GROUP 2

Southern yellow pine.	North Carolina pine.
Hemlock.	Douglas fir.
	Larch (Tamarack).

GROUP 3

White elm.	Black ash.
Red gum.	Black gum.
Sycamore.	Tupelo.
Pumpkin ash.	Maple-soft or silver.

GROUP 4

Hard maple
Beech.
Oak.
Hackberry.

Birch.
Rock elm.
White ash.
Hickory.

(4) Where plywood is authorized, it must be exterior grade moisture-resistant type.

(c) Binding wires and staples shall be as follows:

(1) Galvanized coated annealed steel or other material of equal strength. Washburn and Moen sizes.

(d) Minimum construction requirements for 13-gallon carboys shall be as follows:

Wirebound boxes	Square box for preformed cushions	Octagonal box for preformed cushions	Cylindrical box for preformed cushions	Octagonal box for formed-in-place cushions
Faceboard thickness (sides only—without handle cleats)				
Group 2 woods	5/16"	5/16"	5/16"	1/4"
Groups 3 and 4 woods	1/4"	1/4"	5/16"	1/4"
Faceboard thickness (sides only—with handle cleats)				
Group 2 woods	3/8"	3/8"	5/16"	1/4"
Group 3 woods	5/16"	5/16"	5/16"	1/4"
Cleats	13/16" x 7/8"	13/16" x 7/8"	13/16" x 5/8"	13/16" x 7/8"
Handle cleat	23/8" x 7/8"	23/8" x 7/8"	None	23/8" x 7/8"
<i>Binding wires</i>				
Number and gauge over outside cleats	2-12 gauge	2-12 gauge	2-12 gauge	2-12 gauge
Number and gauge intermediate wires	3-13 gauge	3-13 gauge	2-12 gauge	2-13 gauge
Staples	1 1/4"-16 gauge	1 1/4"-16 gauge	1"-16 gauge	1 1/4"-16 gauge
<i>Top¹</i>				
Face material thickness	9/16"	9/16"	3/8" plywood	9/16"
Battens	4-1 1/8" x 7/8"	2-1 3/8" x 7/8"	None	2-1 3/8" x 7/8"
<i>Base</i>				
Face material thickness	9/16"	9/16"	5/8" plywood	9/16"
Battens	4-1 1/8" x 7/8"	3-1 3/8" x 7/8"	2-1 3/8" x 7/8"	3-1 3/8" x 7/8"
Runners	3 3/8" x 9/16"	2-1 7/8" x 7/8"	2-1 5/8" x 7/8"	2-1 7/8" x 7/8"

¹ A hole of suitable type may be made in top of box to provide for the protruding neck of inner container. There shall be 1 inch minimum clearance between bottle and inside of hole.

² One-half inch plywood face material authorized.

(1) Minimum construction requirements of 6 1/2-gallon carboy shall be as follows:

Wirebound boxes	Dimensions
Faceboard thickness	1/4"
Cleats	13/16" x 7/8"
Handle cleats	2 3/8" x 7/8"
<i>Binding wires:</i>	
Number and gauge over outside cleats	2-12 gauge
Number and gauge intermediate wires	2-13 gauge
Staples	1 1/4"-16 gauge
Base: Face material thickness	3/8" plywood
Battens	1 3/8" x 7/8"
<i>Top (hood cover):</i>	
Side faceboard thickness	1/4"
Cleats	13/16" x 7/8"
<i>Binding wires:</i>	
Number and gauge over outside cleats	2-13 gauge
Top faceboard thickness	3/8" plywood

(i) Outside container closure. When prepared for shipment, top hood cover must be positively secured to body of container.

(e) Assembly:

(1) The box shall be constructed to provide a snug fit with the cushioning for the inside container. Wooden shims of correct thickness may be used to keep carboy tight in overpack.

(2) The boxes shall be closed with threaded loop fasteners using a regular clinch.

§ 178.14-7 Marking of outside container.

(a) On each container with letters and figures at least 3/4 inch high applied

by hot branding iron or colored ink with high pressure dies as follows:

- (1) DOT-1K.
- (2) Name or symbol of person making the mark specified in paragraph (a) (1) of this section and located just above or below that mark. Symbol, if used, must be registered with the Bureau of Explosives.

§ 178.14-8 Tests.

(a) *Apparatus.* Standard required. Detail prints can be obtained from the Bureau of Explosives.

(b) *Method.* Fill with water to lower edge of neck; swing 55 inches measured from wall to nearest bottom edge of basket:

- (1) Test 10 carboys each against bottom and one side.

NOTE 1: Instances where 99 or less carboys are in service during either 6-month period of the year it shall be acceptable to test 10 percent of the total but not less than 3 carboys on both the side and bottom swing.

If this provision is used, the report of test results must so state.

(c) *Acceptable results.* One hundred percent of carboys must not break under side or bottom shocks. If failures occur, the test is to be repeated with an additional 10 carboys for which the passing requirement shall be 100 percent.

(d) When required. By each manufacturer, and each shipper who fills and ships new or used carboys; during each 6 months of each year; separate tests required for:

- (1) New packages.
- (2) Used packages.
- (3) Packages differing in kind or shape of cushioning.

(e) *Exception.* Tests not required by shipper who fills and ships or reships for one shipment only packages obtained from a manufacturer or shipper who has had tests made.

(f) Reports shall be retained on file by the manufacturer or shipper for 3 years.

§ 178.15 Specification 31; jugs in tubs.

§ 178.15-1 Compliance.

(a) Required in all details.

§ 178.15-2 Jugs.

(a) Of acid-resisting material; capacity not over 2 gallons; only 1 jug in each tub.

§ 178.15-3 Size of tub.

(a) Sufficient to allow 1½" space around jug except at top where ½" space is acceptable.

§ 178.15-4 Material for tub.

(a) Of sound wood; 7/16" staves; 7/16" top and bottom; at least 5 wooden hoops 7/8" x 1/4" (approx.) or 3 metal hoops with rolled edge at least 3/4" x 29 gauge United States standard.

§ 178.15-5 Construction.

(a) Staves to be set up evenly; bottom hoop to be fastened with at least seven 4-penny nails driven through hoop, through staves, and into bottom of tub; other hoops to be securely fastened in place.

§ 178.15-6 Cushioning.

(a) To be tightly packed with adequate cushioning material.

§ 178.15-7 Marking.

(a) On each container with letters and figures at least ½" high in rectangle as follows:

DOT-31

(b) Each container must also be marked with the name or symbol of person making the mark specified in paragraph (a) of this section. Symbol, if used, must be registered with the Bureau of Explosives.

§ 178.15-8 Closing for shipment.

(a) Jug to be closed by rubber stoppers, or other closure equally acid-resistant; cork stoppers not authorized. Top of tub to be secured in place by at least four substantial metal strips, at least 7/16" x 3½" nailed to side and top of tub.

§ 178.18 Specification 43A; rubber drums.

§ 178.18-1 Compliance.

(a) Required in all details.

§ 178.18-2 Rated capacity.

(a) As marked, see § 178.18-8. Actual capacity shall be rated capacity plus at least 2 percent.

§ 178.18-3 Body and heads.

(a) Of at least two laminations; inside lamination of synthetic rubber, or of pale crepe rubber compounded with paraffin or otherwise treated, such as to be capable of withstanding the action of hydrofluoric acid, up to 65 percent hydrofluoric acid maximum, for 30 days without any substantial deterioration; other laminations of cotton fiber and rubber.

§ 178.18-4 Rolling hoops.

(a) Tough rubber free from cotton or other fiber.

§ 178.18-5 The drum.

(a) Body, heads, lining, rolling hoops, and filling hole flange to be all vulcanized together at one operation. No cements, adhesives or secondary vulcanization authorized.

§ 178.18-6 Parts and dimensions.

(a) Parts and dimensions as follows:

Rated capacity (U.S. wine gallons) ¹	Minimum weight (pounds)	Rolling hoops					
		Minimum thickness		Chime (quarter round)		Body (half round)	
		Body (inch)	Heads (inch)	Width (inches)	Depth (inch)	Width (inches)	Depth (inch)
5	18	3/8	1/2	1 3/4	3/4	.....	.....
13	30	3/8	1/2	2	1	2	1
30	85	9/16	1 1/16	2 9/16	1	2 1/4	1

¹ Other capacities not authorized.

§ 178.18-7 Closures.

(a) To be such as to prevent spillage or leakage in transit and must be approved by the Bureau of Explosives.

§ 178.18-8 Marking on each container.

(a) Marking on top head plainly and permanently as follows:

(1) DOT-43A.

(2) Name or symbol of person making the mark specified in paragraph (a) (1)

of this section and located just above, below, or following that mark. Symbol, if used, must be registered with the Bureau of Explosives.

(3) Rated gallonage and year of manufacture (for example, 5-50).

§ 178.18-9 Type tests.

(a) Samples, taken at random and closed as for use, shall withstand prescribed tests without leakage. Tests to be made of each type and size by each company starting production and to be repeated every four months. Samples last tested to be retained until further tests are made. The type tests are as follows:

(1) Test by dropping, filled with water to 98 percent capacity, from height of 6 feet onto solid concrete so as to strike diagonally on top chime. Also a 4-foot drop to strike directly on closing device. Parts projecting beyond chime or rolling hoops must also be capable of withstanding this test.

(2) Hydrostatic pressure test of 40 pounds per square inch sustained for 5 minutes, using drums which have passed the drop test; side walls must not expand beyond chime hoops.

§ 178.18-10 Material test.

(a) Samples from side wall and end must have breaking strength at least 1,200 pounds per square inch.

§ 178.19 Specification 34; reusable molded polyethylene container for use without overpack. Removable head not authorized.

§ 178.19-1 Compliance.

(a) Required in all details.

§ 178.19-2 Material.

(a) Containers shall be made of polyethylene which shall have the following properties, as determined by the American Society for Testing Materials (ASTM) methods designated. Tests shall be performed on resin with additives included:

Property	Specification	ASTM method
Melt index.....	1.2 maximum.....	D 1238 (62T).
Density range.....	0.941-0.965.....	D 1505 (63T).
Tensile strength....	3,000 p.s.i. minimum.	D 638 (61T).
Percent elongation.	75 percent minimum.	D 638 (61T).

(b) Ultraviolet light protection shall be provided by impregnation of polyethylene with carbon black or other equally efficient pigments or inhibitors. These additives must be compatible with lading and must retain their effectiveness for the life of the container.

(c) Other materials may be added provided they do not adversely affect the physical properties specified in paragraph (a) of this section or the performance specified in § 178.19-7.

§ 178.19-3 Construction and capacity.

(a) Container must be constructed in accordance with the following table:

Marked (rated) capacity not over (gallons) ¹	Minimum thickness (inches) measured on any point of container
2½ thru 6½.....	0.045
15 .....	.075
30 .....	.125

¹ Minimum actual capacity shall not be less than rated capacity plus 4 percent. Maximum actual capacity shall not be greater than rated capacity plus 15 percent for containers up to 15 gallons and shall not be greater than rated capacity plus 10 percent for containers 15 gallons and over.

§ 178.19-4 Closure.

(a) Openings shall not exceed 2.7 inches in diameter.

(b) Closures shall be of material resistant to lading and adequate to prevent leakage under tests prescribed in § 178.19-7 and under conditions incident to transportation.

(c) Vented closures where specified in Part 173 of this chapter are authorized.

§ 178.19-5 Defective containers.

(a) Containers with repaired bodies not authorized.

§ 178.19-6 Marking.

(a) Each container must be permanently marked by embossment in letters and figures at least ½ inch in size as follows:

(1) DOT-34*; stars to be replaced by the rated capacity of the container (for example, DOT-34-5).

(2) Month and year of manufacture. For example, DOT-34-5-6/65 to indicate

a container of 5 gallons capacity made in June 1965.

(3) Name or symbol of person making the marks specified in paragraphs (a) (1) and (a) (2) of this section and located just above or below those marks. Symbol, if used, must be registered with the Bureau of Explosives.

§ 178.19-7 Tests.

(a) At least three samples taken at random, filled and prepared as specified and closed as for use, shall be capable of withstanding the tests in subparagraphs (1), (2), and (3) of this paragraph without leakage. These tests shall be performed at the start of initial production and at 4-month intervals and shall be repeated on any change of type, size, materials, or process method. No single container shall be expected to withstand more than one of the following tests:

(1) The container filled to 98 percent capacity with water shall be dropped from a height of 4 feet onto solid concrete so as to drop diagonally on top edge or any part constructed to a lesser strength.

(2) The container filled to 98 percent capacity with a solution compatible with polyethylene and which remains liquid at 0° F. shall be dropped from a height of 4 feet onto solid concrete on any part of the container when container and contents are at or slightly below 0° F. Filled container shall be stored at 0° F. or lower temperature for at least 4 hours immediately preceding test.

(3) The container shall be tested by retaining for 5 minutes hydrostatic pressure of at least 15 pounds per square inch at equilibrium without showing pressure drop or evidence of leakage.

(b) At least three containers taken at random from each continuous production lot of no more than 1,000 containers of each given type and size shall withstand without leakage or failure the test prescribed in § 178.19-7(a) (2).

(c) At least three containers of each size and type taken at random at start of initial production, and upon any change in materials, design, or process method shall withstand without failure or leakage the following tests. No single container shall be expected to withstand more than one test:

(1) The container filled to 98 percent of capacity with water shall be capable of withstanding a vibration test by placing the container on the vibration table

anchored in such manner that all horizontal motion shall be restricted and only vertical motion allowed. The test shall be performed for one hour using an amplitude of one inch at a frequency that causes the test container to be raised from the floor of the table to such a degree that a piece of paper or flat steel strap or tape can be passed between the table and the container.

(2) The container filled to 98 percent capacity with water shall withstand the following static compression test without buckling of the side walls sufficient to cause damage, but in no case shall the maximum top to bottom deflection be more than one inch. Compression shall be applied to the load bearing areas of the top of the container for a period of not less than 48 hours.

Marked (rated) capacity (gallons)	Compression test (pounds)
2½ thru 6½	600
15	1,200
30	1,800

(d) Records of test results to be maintained in current status and retained by each manufacturer at each producing plant.

Subpart B—Specifications for Inside Containers, and Linings

§ 178.20 Specification 2A; inside containers, metal cans, pails and kits.

§ 178.20-1 Capacity, thickness of metal, Test and closure.

(a) *Capacity.* Not over 10 gallons.

(b) *Thickness of metal.* At least 28-gauge, United States standard (commercial 135-pound tin plate), for cans over 1-gallon capacity; smaller cans of metal of adequate thickness.

(c) *Test.* By interior pressure on each completed can, without leakage.

(d) *Closure.* Air-tight and leakproof.

(e) "Marking." Each container must be marked as prescribed in § 173.24 of this subchapter.

§ 178.21 Specification 2T; polyethylene container.

§ 178.21-1 Compliance.

(a) Required in all details.

§ 178.21-2 Capacity and marking of container.

(a) Containers of 5 to 13 gallons capacity are covered by this specification. Actual capacity of the container must be the marked capacity plus 5 percent minimum.

(b) Each container must be permanently marked with figures and letters at least $\frac{1}{4}$ inch high to show:

(1) DOT-2T.

(2) Name or symbol of person making the mark specified in paragraph (b) (1) of this section. Symbol, if used, must be registered with the Bureau of Explosives.

(3) Month and year of manufacture.

§ 178.21-3 Material.

(a) Containers shall be made of polyethylene and shall have the following properties (see Note 1):

Melt index..... 2.6 maximum.

Density 0.910-0.925.

Tensile strength..... 1500 pounds per square inch minimum.

Percent elongation... 400 percent minimum.

NOTE 1: Properties to be obtained by a test method approved by Bureau of Explosives. Other materials may be added which shall not affect the properties specified in paragraph (a) of this section.

(1) Container must have a minimum weight and wall thickness in accordance with the following table:

Marked capacity not over (gallons)	Minimum wall thickness (inch)	Minimum weight of containers (pounds)
5.....	0.0625	3
6½.....	.0625	4
13.....	.0625	8

(b) Closing device shall be of material resistant to the lading and adequate to prevent leakage and not over $3\frac{1}{2}$ inches in diameter.

(c) Tests. Samples taken at random, empty or filled, and prepared as specified and closed as for use, shall be capable of withstanding the following tests without breakage or leakage:

(1) Empty container shall be dropped on any part from a height of 6 feet onto solid concrete, immediately after conditioning for at least 24 hours at 0° F.

(2) The polyethylene container in a prescribed outer specification container,

as authorized by Part 173 of this chapter, filled to 98 percent of capacity with water shall be dropped from a height of 4 feet onto solid concrete so as to drop diagonally on top edge of any part considered weaker.

(3) The polyethylene container in a prescribed outer specification container, as authorized in Part 173 of this chapter filled to 98 percent of capacity with a solution which is compatible with polyethylene and remains liquid at 0° F. shall be dropped from a height of 4 feet onto solid concrete on any part of the container when container and contents are at or slightly below 0° F.

(4) The polyethylene container in a prescribed outer specification container as authorized in Part 173 of this chapter, filled to 98 percent of capacity with water shall be capable of withstanding a vibration test by placing the container on the vibration table anchored in such manner that all horizontal motion shall be restricted and only vertical motion allowed. The test shall be performed for 1 hour using an amplitude of 1 inch at a frequency that causes the test container to be raised from the floor of the table to such a degree that a piece of paper or flat steel strap or tape can be passed between the table and the container.

(d) Polyethylene container must fit snugly in outside container.

§ 178.22 Specification 2C; inside containers, corrugated fiberboard cartons.

§ 178.22-1 Construction.

(a) To be of double-wall board, 275-pound strength, or 2 thicknesses of double-faced board, 175-pound strength. Mullen or Cady test; slides or linings to be 1-piece with joint cloth-taped.

§ 178.22-2 Outside container.

(a) Outside container must be lined throughout with, and cartons separated by, double-wall corrugated fiberboard of 275-pound strength, Mullen or Cady test.

§ 178.23 Specification 2D; inside containers, duplex paper bags.

§ 178.23-1 Construction.

(a) Bags to be at least 2 thicknesses of shipping sack Kraft paper, or equivalent, and as follows:

Maximum weight of contents (pounds)	Minimum ¹ weight (per 500 sheets 24" x 36")	
	One sheet, weight ¹ (pounds)	Other sheet, weight ¹ (pounds)
2.....	30	30
6.....	50	40
12.....	60	50
25.....	70	60

¹ Weight 15 percent less authorized for rope paper containing 35 percent or more of manila rope fiber.

§ 178.23-2 Test.

(a) Bags, filled and closed as for shipment, must be able to withstand drop of 4 feet onto concrete without rupture or sifting, except that 2-foot drop is acceptable for bags to contain 25 pounds.

§ 178.24 Specification 2U: molded or thermoformed polyethylene containers having rated capacity of over one gallon. Removable head containers or containers fabricated from film not authorized.

§ 178.24-1 Compliance.

(a) Required in all details.

§ 178.24-2 Material.

(a) Containers shall be made of polyethylene and shall have the following properties (see Note 1):

Melt index..... 2.6 maximum.

Density 0.910-0.925.

Tensile strength.... 1500 pounds per square inch minimum.

Percent elongation.. 400 percent minimum.

NOTE 1: Properties to be obtained by a test method approved by Bureau of Explosives. Other materials may be added which shall not affect the properties specified in paragraph (a) of this section.

NOTE 2: Type III polyethylene, as specified in Appendix B to this part, is authorized for containers up to 6 gallons marked capacity (6½ gallons maximum capacity).

§ 178.24-3 Construction capacity.

(a) Container must be constructed in accordance with the following table:

Rated capacity not over (gallons)	Minimum overall thickness (inch) ¹	Percent outage over marked capacity permitted
5.....	0.010	15
15.....	.015	15
55.....	.015	5

¹ For cubical containers, the area adjacent to and forming the opening for closure may have a minimum thickness of 0.008 inch for 5 gallons rated capacity and sizes larger than 5 gallons may have a minimum thickness of 0.010 inch.

(b) Polyethylene container must fit snugly in outside container.

§ 178.24-4 Closure.

(a) Shall be of material resistant to lading and adequate to prevent leakage. Vented closures where specified under Part 173 of this chapter authorized. No opening over 2.7 inches in diameter authorized.

§ 178.24-5 Marking.

(a) Each container must be permanently marked by embossment in figures and letters at least ¼ inch in size to show:

(1) DOT-2U.

(2) Name or symbol of person making the mark specified in paragraph (a) (1) of this section. Symbol, if used, must be registered with the Bureau of Explosives.

(3) Month and year of manufacture.

(4) Rated capacity.

§ 178.24-7 Tests.

(a) Samples taken at random shall withstand prescribed tests without breakage or leakage. Tests shall be made on each type and size at each manufacturing location starting production and shall be repeated every four months. The type tests are as follows:

(1) The polyethylene container in a prescribed outer specification container, as authorized by Part 173 of this chapter, filled to 98 percent of capacity with water shall be dropped from a height of 4 feet onto solid concrete so as to drop diagonally on top edge or any part considered weaker.

(2) The polyethylene container in a prescribed outer specification container, as authorized by Part 173 of this chapter,

filled to 98 percent of capacity with a solution which is compatible with polyethylene and remains liquid at 0° F. shall be dropped from a height of 4 feet onto solid concrete on any part of the container when container and contents are at or slightly below 0° F.

(3) The polyethylene container in a prescribed outer specification container, as authorized in Part 173 of this chapter, filled to 98 percent of capacity with water shall be capable of withstanding a vibration test by placing the container on the vibration table anchored in such manner that all horizontal motion shall be restricted and only vertical motion allowed. The test shall be performed for one hour using an amplitude of one inch at a frequency that causes the test container to be raised from the floor of the table to such a degree that a piece of paper or flat steel strap or tap can be passed between the table and the container.

§ 178.24a Specification 2E; inside polyethylene bottle.

§ 178.24a-1 General requirements.

(a) Each bottle must meet the applicable requirements of § 173.24 of this chapter.

§ 178.24a-2 Rated capacity.

(a) Maximum capacity must be not more than 5 quarts (4.73 liters).

§ 178.24a-3 Materials of construction.

(a) Each bottle must be made of a blow-molding grade of polyethylene, constructed so that it will maintain its shape when standing empty and open.

(b) Wall thickness must not be less than 0.008 inch (0.2 millimeters).

(c) Polyethylene must have properties as specified in Table I of Appendix B to this Part.

§ 178.24a-4 Closure.

(a) Closing devices must provide a tight seal. Vented closures are not authorized unless otherwise provided for in Part 173 of this chapter.

§ 178.24a-5 Tests.

(a) Each bottle must be capable of withstanding the prescribed tests without breaking or leaking.

(b) The test prescribed in paragraph (d)(1) of this section must be made on at least three random sample bottles for each 1,000 bottles produced by each blow-molding machine. The test must be performed at the start of initial production from each blow-molding machine and upon any change in type of polyethylene or process method.

(c) The test prescribed in paragraph (d)(2) of this section must be made at least once each month on a minimum of three random sample bottles produced and upon any change in type of polyethylene or process method.

(d) Prescribed tests:

(1) The bottle, filled to 98 percent of capacity with water, must be dropped from a height of 4 feet onto a solid unyielding surface so as to drop diagonally on the top edge or any other part which is weaker.

(2) The bottle, filled to 98 percent of capacity with a liquid which is compatible with polyethylene and which is liquid at 0° F., must be dropped from a height of 4 feet onto a solid unyielding surface, on any part of the bottle. Immediately prior to the test, the bottle and its contents must have been at a temperature of 0° F. or lower for at least 24 hours.

§ 178.24a-6 Marking.

(a) Marking must be as prescribed in § 173.24 of this subchapter, except as follows:

(1) Marking must be by embossment in at least $\frac{1}{16}$ inch figures for bottles of one quarter or less capacity and at least $\frac{1}{4}$ inch figures for bottles of more than one quart capacity as follows: "DOT-2E", the minimum thickness of the polyethylene in thousandths of inches (mils), and the year of manufacture (e.g., DOT-2E 15-69).

§ 178.25 Specification 2F; inside metal containers and liners.

§ 178.25-1 Construction.

(a) Containers over 1-gallon capacity and all lining must be at least 30 gauge.

United States standard (commercial 107-pound tin plate) and sealed leakproof.

§ 178.26 Specification 2G; inside containers, fiber cans and boxes.

§ 178.26-1 Capacity, and thickness of metal and fiber.

(a) Capacity not over 6 pounds, net. Metal tops, bottoms, and connections of suitable thickness are authorized. Minimum fiber thickness as follows:

- (1) Up to $\frac{1}{4}$ -pound size: 0.021".
- (2) Up to 1-pound size: 0.026".
- (3) Up to 3-pound size: 0.036".
- (4) Up to 6-pound size: 0.050", provided that 0.036" fiber heads with 130-pound strength¹ are authorized; or 0.028" with 175-pound strength;¹ or 0.036" with 90-pound strength,¹ provided each container is wrapped with shipping sack Kraft paper of 60-pound base weight pasted thereon.

§ 178.27 Specification 2TL; polyethylene container.

§ 178.27-1 Material requirements.

(a) Containers shall be made of polyethylene and shall have the following properties (see Note 1):

Melt index.....	2.6 maximum.
Density	0.910-0.925.
Tensile strength....	1500 pounds per square inch minimum.
Percent elongation...	400 percent minimum.

NOTE 1: Properties to be obtained by a test method approved by the Bureau of Explosives. Other materials may be added which shall not affect the properties specified in paragraph (a) of this section.

§ 178.27-2 Construction, capacity and marking.

(a) Container must be constructed in accordance with the following table:

Marked capacity ¹ not over (gallons)	Minimum wall thickness (inches)	Minimum weight of containers (pounds)
5.....	0.015	1
14.....	.050	5½

¹ Actual capacity must be the marked capacity plus 5 percent minimum.

(b) Closure: Closure shall be of material resistant to lading and adequate to prevent leakage. Vented closures where specified under Part 173 of this

¹ Mullen or Cady test.

chapter authorized. No opening over 3½ inches in diameter authorized.

(c) Marking: Each container must be permanently marked in figures and letters at least $\frac{1}{4}$ inch in size to show:

- (1) DOT-2TL.
- (2) Name or symbol of person making the mark specified in paragraph (c) (1) of this section. Symbol, if used, must be registered with the Bureau of Explosives.
- (3) Month and year of manufacture.
- (4) Rated (marked) capacity.
- (d) Polyethylene container must fit snugly in outside container.

§ 178.27-3 Type test.

(a) Samples taken at random shall withstand prescribed test without breakage. Test shall be made on each type and size at each manufacturing location starting production and shall be repeated every four months. The type test is as follows:

- (1) Empty container shall be dropped on any part from a height of 6 feet onto solid concrete, immediately after conditioning for at least 24 hours at 0° F.

§ 178.27-4 Tests.

(a) Samples taken at random, filled and prepared as specified and closed as for use, shall be capable of withstanding the following tests without leakage:

- (1) The polyethylene container in a prescribed outer specification container as authorized by Part 173 of this chapter, filled to 98 percent capacity with water shall be dropped from a height of 4 feet onto solid concrete so as to drop diagonally on top edge or on any part considered weaker.

(2) The polyethylene container in a prescribed outer specification container, as authorized by Part 173 of this chapter, filled to 98 percent capacity with a solution which is compatible with polyethylene and remains liquid at 0° F. shall be dropped from a height of 4 feet onto solid concrete on any part of the container when container and contents are at or slightly below 0° F.

(3) The polyethylene container in a prescribed outer specification container, as authorized in Part 173 of this chapter, filled to 98 percent of capacity with water shall be capable of withstanding a vibration test by placing the container on the vibration table anchored in such

manner that all horizontal motion shall be restricted and only vertical motion allowed. The test shall be performed for 1 hour using an amplitude of 1 inch at a frequency that causes the test container to be raised from the floor of the table to such a degree that a piece of paper or flat steel strap or tape can be passed between the table and the container.

§ 178.28 Specification 2J; inside containers, waterproof paper bags for linings.

§ 178.28-1 Material.

(a) Two sheets of paper cemented together and creped to afford 25 percent stretch; paper to be shipping sack Kraft 30 pounds per ream (500 sheets, 24" x 36") before creping; total weight 90 pounds per ream.

§ 178.28-2 Test.

(a) Material folded into cones and filled with water to depth of 2" at 70° F. must not show water on outside within 24 hours.

§ 178.28-3 Construction.

(a) Form to fit the outside container without stretching; seams and closures to afford a siftproof bag.

§ 178.29 Specification 2K; inside containers, paper bags for linings.

§ 178.29-1 Paper and construction.

(a) Shipping sack Kraft paper, creped; at least 45 pounds per ream (500 sheets, 24" x 36") before creping.

(b) *Construction.* Form to fit the outside container without stretching; seams and closure to afford a siftproof bag.

§ 178.30 Specification 2L; lining for boxes.

§ 178.30-1 Box lining.

(a) Box lining must be of strong paraffined paper, or other suitable material, without joints or other openings at the bottom or at sides of box, and shall fully protect contents in contact with top of box.

(b) Tensile strength of material must be at least 35 pounds with the grain and 17 pounds across grain, tested by direct pull on strips measuring 3" by 1". Average results of three or more tests with the grain and three or more across grain shall be used.

(c) Material shall be impervious to water and nitroglycerin at 77° F. Test for imperviousness shall consist of folding material into cones, loosely to avoid breakage at creases. Cones tested for nitroglycerin shall be filled to 1" depth; those for water to 2". No leakage of liquid shall occur during 24 hours' exposure.

(d) Material must transmit no oily or greasy stain to unglazed paper. Test shall consist of placing one thickness of material, with two thicknesses of unglazed paper on each side, in an oven at 104° F. for 24 hours, under pressure of a lead disk 1½" thick and of 10 pounds weight resting edgewise on the paper.

(e) Saturating paraffin, when used, shall have melting point of 125° F. or above. Test shall consist of extracting paraffin from 1 ounce or more of material with ether. After evaporation of all ether, paraffin shall be melted and poured upon the surface of water contained in a hemispherical dish approximately 3¾" in diameter. Dish shall be three-fourths full of water above melting point of paraffin. Thermometer shall be placed with bulb three-fourths immersed in center of dish. Water and paraffin shall be allowed to cool until paraffin upon the surface of water commences to solidify. Temperature shall then be read and recorded as melting point of paraffin.

§ 178.30-2 Bag.

(a) Bag complying with requirements of paragraphs (b), (c), and (d) of this section also authorized.

(b) Material must be: 2 sheets of shipping sack Kraft paper joined by asphaltum, or equivalent; outer sheet at least 60 pounds and inner sheet at least 30 pounds per ream (500 sheets, 24" x 36"); inner sheet coated with wax, or equivalent, with melting point at least 125° F.; compliance with § 178.30-1 (b) and (c) required.

(c) Seams must be pasted with adhesive not affected by nitroglycerin.

(d) Completed bag must be formed to fit outside container without undue strain and must be impervious to seepage of nitroglycerin.

§ 178.31 Specification 2M; waterproofed paper lining.

§ 178.31-1 Waterproofed paper.

(a) Waterproofed paper for box lining must be strong, folded or constructed without joints or openings at sides, bot-

toms, or ends, and shall fully protect contents at top of box.

§ 178.32 Specification 2N; inside containers, metal cans.

§ 178.32-1 Size.

(a) Not over 14-pounds water capacity (388 cubic inches).

§ 178.32-2 Material.

Each can must be made of good quality tin plate with parts and dimensions in compliance with the requirements of the following table:

Maximum diameter of can (inches)	Minimum thickness of metal (inch)	
	In body	In heads
4 $\frac{5}{16}$	0.01134 (107 lb tin plate).	0.01305 (128 lb tin plate). ¹
6 $\frac{1}{4}$	0.01134 (107 lb tin plate).	0.01485 (148 lb tin plate). ²
6 $\frac{1}{2}$	0.01405 (135 lb tin plate).	0.01405 (135 lb tin plate). ³

¹ The minimum thickness of metal in each head may be 107 lb tin plate provided side seams are soldered and heads are attached to body sections by full double seams internally soldered.

² The minimum thickness of metal in each head may be 135 lb tin plate provided side seams are soldered and heads are attached to body sections by full double seams internally soldered.

³ Top heads must be attached to body sections by full double seams with durable seaming compound, and bottom heads must be attached to body sections by soldering.

§ 178.32-3 Manufacture.

(a) Seams soldered or full double seam. Outside surface rustproofed by lacquer or equivalent.

§ 178.32-4 Test.

(a) When closed as for shipment, must be capable of standing 40-pound interior pressure without leakage.

§ 178.33 Specification 2P; inside nonrefillable metal containers.

§ 178.33-1 Compliance.

(a) Required in all details.

§ 178.33-2 Type and size.

(a) Single-trip inside containers. Must be seamless, or with seams, welded, soldered, brazed, double seamed, or swedged.

(b) The maximum capacity of containers in this class shall not exceed 50 cubic inches (27.7 fluid ounces). The

maximum inside diameter shall not exceed 3 inches.

§ 178.33-3 Inspection.

(a) By competent inspector.

§ 178.33-4 Duties of inspector.

(a) To inspect material and complete containers and witness tests, and to reject defective materials or containers.

§ 178.33-5 Material.

(a) Uniform quality steel plate such as black plate, electro-tin plate, hot dipped tin plate, tern plate or other commercially accepted can making plate; or nonferrous metal of uniform drawing quality.

(b) Material with seams, cracks, laminations or other injurious defects not authorized.

§ 178.33-6 Manufacture.

(a) By appliances and methods that will assure uniformity of completed containers; dirt and scale to be removed as necessary; no defect acceptable that is likely to weaken the finished container appreciably; reasonably smooth and uniform surface finish required.

(b) Seams when used must be as follows:

(1) Circumferential seams: By welding, swedging, brazing, soldering, or double seaming.

(2) Side seams: By welding, brazing, or soldering.

(c) Ends: The ends shall be of pressure design.

§ 178.33-7 Wall thickness.

(a) The minimum wall thickness for any container shall be 0.007 inch.

§ 178.33-8 Tests.

(a) One out of each lot of 25,000 containers or less, successively produced per day shall be pressure tested to destruction and must not burst below 240 pounds per square inch gauge pressure. The container tested shall be complete with end assembled.

(b) Each such 25,000 containers or less, successively produced per day, shall constitute a lot and if the test container shall fail, the lot shall be rejected or ten additional containers may be selected at

random and subjected to the test under which failure occurred. These containers shall be complete with ends assembled. Should any of the ten containers thus tested fail, the entire lot must be rejected. All containers constituting a lot shall be of like material, size, design construction, finish, and quality.

§ 178.33-9 Marking.

(a) By means of printing, lithographing, embossing, or stamping, each container must be marked to show:

(1) DOT-2P.

(2) Name or symbol of person making the mark specified in paragraph (a) (1) of this section. Symbol, if used, must be registered with the Bureau of Explosives.

§ 178.33a Specification 2Q, inside non-refillable metal containers.

§ 178.33a-1 Compliance.

(a) Required in all details.

§ 178.33a-2 Type and size.

(a) Single-trip inside containers. Must be seamless, or with seams welded, soldered, brazed, double seamed, or swedged.

(b) The maximum capacity of containers in this class shall not exceed 50 cubic inches (27.7 fluid ounces). The maximum inside diameter shall not exceed 3 inches.

§ 178.33a-3 Inspection.

(a) By competent inspector.

§ 178.33a-4 Duties of inspector.

(a) To inspect material and completed containers and witness tests, and to reject defective materials or containers.

§ 178.33a-5 Material.

(a) Uniform quality steel plate such as black plate, electrotin plate, hot dipped tinplate, ternplate or other commercially accepted can making plate; or nonferrous metal of uniform drawing quality.

(b) Material with seams, cracks, laminations or other injurious defects not authorized.

§ 178.33a-6 Manufacture.

(a) By appliances and methods that will assure uniformity of completed containers; dirt and scale to be removed as necessary; no defect acceptable that is likely to weaken the finished container appreciably; reasonably smooth and uniform surface finish required.

(b) Seams when used must be as follows:

(1) Circumferential seams. By welding, swedging, brazing, soldering, or double seaming.

(2) Side seams. By welding, brazing or soldering.

(c) Ends. The ends shall be of pressure design.

§ 178.33a-7 Wall thickness.

(a) The minimum wall thickness for any container shall be 0.008 inch.

§ 178.33a-8 Tests.

(a) One out of each lot of 25,000 containers or less, successively produced per day, shall be pressure tested to destruction and must not burst below 270 pounds per square inch gauge pressure. The container tested shall be complete with end assembled.

(b) Each such 25,000 containers or less, successively produced per day, shall constitute a lot and if the test container shall fail, the lot shall be rejected or ten additional containers may be selected at random and subjected to the test under which failure occurred. These containers shall be complete with ends assembled. Should any of the ten containers thus tested fail, the entire lot must be rejected. All containers constituting a lot shall be of like material, size, design, construction, finish and quality.

§ 178.33a-9 Marking.

(a) By means of printing, lithographing, embossing, or stamping, each container must be marked to show:

(1) DOT-2Q.

(2) Name or symbol of person making the mark specified in paragraph (a) (1) of this section. Symbol, if used, must be registered with the Bureau of Explosives.

§ 178.34 Specification 2R: inside containment vessel.

§ 178.34-1 General requirements.

(a) Each vessel must be made of stainless steel, malleable iron, or brass, or other material having equivalent physical strength and fire resistance.

(b) Each vessel must meet all of the applicable requirements of § 173.24 (c) and (d) of this subchapter. Letters and numerals at least 6 millimeters ($\frac{1}{4}$ -inch) in height are authorized for the marking of a vessel not exceeding 5 centimeters (2 inches) inside diameter.

§ 178.34-2 Manufacture.

The ends of the vessel must be fitted with screw-type closures or flanges (see § 178.34-4), except that one or both ends of the vessel may be permanently closed by a welded or brazed plate. Welded or brazed side seams are authorized.

§ 178.34-3 Dimensions.

(a) The inside diameter of the vessel may not exceed 30 centimeters (12 inches) exclusive of flanges for handling or fastening devices and must have wall thickness and length in accordance with the following:

Inside diameter maximum		Wall thickness minimum		Length maximum		
Inches	Centi- meters	Threaded closure		Flanged closure	Inches	Centi- meters
		Inches	Millimeters			
2	5	3⁄16	2.5	Not less than that prescribed for sched- ule to pipe.	16	41
6	15	1⁄8	3.2		7.2	183
12	30	1⁄4	6.5		7.2	183

§ 178.34-4 Closure devices.

(a) Each closure device must be as follows:

(1) Screw-type cap or plug; number of threads per inch must not be less than United States standard pipe threads and must have sufficient length of thread to engage at least 5 threads when securely tightened. Pipe threads must be luted with an appropriate non-hardening compound which must be capable of withstanding up to 149° C. (300° F) without loss of efficiency. Tightening torque must be adequate to maintain leak tightness with the specific luting compound.

(2) An opening may be closed by a securely bolted flange and leak-tight gasket. Each flange must be welded or brazed to the body of the 2R vessel per (ANSI) Standard B16.5 or (AWWA) Standard C207-55, section 10. A torque wrench must be used in securing the flange with a corresponding torque of no

more than twice the force necessary to seal the selected gasket. Gasket material must be capable of withstanding up to 149° C (300° F) without loss of efficiency. The flange, whether of ferrous or non-ferrous metal, must be constructed from the same metal as the vessel and must meet the dimensional and fabrication specifications for welded construction as follows:

(i) Pipe flanges described in Tables 13, 14, 16, 17, 19, 20, 22, 23, 25 and 26 of ANSI B16.5.

(ii) For nominal pipe sizes, 6, 8, 10, and 12 inches, AWWA Standard C207-55 Table 1, class B, may be used in place of the tables prescribed by paragraph (a) (2) (i) of this section.

(iii) Sizes under 6 inches, nominal pipe size, the following table with the same configuration as illustrated in AWWA C207-55, Table 1, class B, may be used in place of paragraph (a) (2) (i) of this section.

Nominal pipe size		Flange O.D.		Number of bolts	Bolt circle diameter		Diameter of bolts		Flange thickness	
Inches	Centimeters	Inches	Centimeters		Inches	Centimeters	Inches	Centimeters	Inches	Centimeters
2	5	6	15	4	$4\frac{1}{4}$	11.8	$\frac{1}{2}$	1.2	$\frac{3}{8}$	1.6
$2\frac{1}{2}$	6.2	7	17.5	4	$5\frac{1}{4}$	13.8	$\frac{1}{2}$	-----	$\frac{3}{8}$	-----
3	7.5	$7\frac{1}{2}$	18.8	4	6	15	$\frac{1}{2}$	-----	$\frac{3}{8}$	-----
$3\frac{1}{2}$	8.8	$8\frac{1}{2}$	21.3	8	7	17.5	$\frac{1}{2}$	-----	$\frac{3}{8}$	-----
4	10	9	22.5	8	$7\frac{1}{2}$	18.8	$\frac{1}{2}$	-----	$\frac{3}{8}$	-----
5	12.6	10	25.4	8	$8\frac{1}{2}$	21.3	$\frac{1}{2}$	-----	$\frac{3}{8}$	-----

(iv) Cast iron flanges prohibited.

§ 178.35 Specification 2S; polyethylene container.

Removable head container not authorized.

§ 178.35-1 Compliance.

(a) Required in all details.

§ 178.35-2 Material requirements.

(a) Container shall be made of polyethylene and shall have the following properties (see Note 1):

Melt index-----	2.6 maximum.
Density-----	0.910-0.925.
Tensile strength-----	1,500 pounds per square inch minimum.
Percent elongation-----	400 percent minimum.

NOTE 1: Properties to be obtained by a test method approved by the Bureau of Explosives. Other materials may be added which shall not affect the properties.

§ 178.35-3 Construction, capacity and marking.

(a) Container must be constructed in accordance with the following table:

Marked capacity not over (gallons) ¹	Maximum capacity (gallons)	Minimum thickness—side wall and heads (inches) ²	Minimum weight (pounds)
5-----	6	0.0625	1.4
13.5-----	14.5	.0625	3.25
15-----	16	.0625	3.5
30-----	32	.0625	5.5
55-----	58	.0625	9

¹ Marked capacity shall be minimum capacity.

² Side openings are not authorized.

(b) Marking: Each container must be permanently marked with figures and letters at least ¼ inch in size to show:

(1) DOT-2S.

(2) Name or symbol of person making the mark specified in paragraph (b) (1) of this section. Symbol, if used, must be registered with the Bureau of Explosives.

(3) Month and year of manufacture.

(4) Minimum capacity.

(c) Polyethylene container must fit snugly in outside container.

§ 178.35-4 Closures.

(a) Closing devices must be of screw thread type or fastened by positive means and be of material resistant to the lading and adequate to prevent leakage.

(b) Openings over 2.3 inches in diameter not permitted.

§ 178.35-5 Tests.

(a) Samples taken at random, empty or filled, and prepared as specified and closed as for use, shall be capable of withstanding the following tests without breakage or leakage:

(1) Empty container shall be dropped on any part from a height of 6 feet onto solid concrete, immediately after conditioning for at least 24 hours at 0° F.

(2) The polyethylene container in a prescribed outer specification container, as authorized by Part 173 of this chapter, filled to 98 percent of capacity with water shall be dropped from a height of 4 feet onto solid concrete so as to drop diagonally on top edge or any part considered weaker.

(3) The polyethylene container in a prescribed outer specification container, as authorized by Part 173 of this chapter, filled to 98 percent of capacity with a solution which is compatible with polyethylene and remains liquid at 0° F. shall be dropped from a height of 4 feet onto solid concrete on any part of the container when container and contents are at or slightly below 0° F.

(4) The polyethylene container in a prescribed outer specification container, as authorized in Part 173 of this chapter, filled to 98 percent of capacity with water shall be capable of withstanding a vibration test by placing the container on the vibration table anchored in such manner that all horizontal motion shall be restricted and only vertical motion allowed. The test shall be performed for 1 hour using an amplitude of 1 inch at a frequency that causes the test container to be raised from the floor of the table to such a degree that a piece of paper or flat steel strap or tape can be passed between the table and the container.

§ 178.35a Specification 2SL; molded or thermoformed polyethylene container.

Removable head container or container fabricated from film not authorized.

§ 178.35a-1 Material requirements.

(a) Container shall be made of polyethylene and have the following properties (see Note 1):

Melt index.....	2.6 maximum.
Density.....	0.910-0.925
Tensile strength.....	1,500 pounds per square inch minimum.
Percent elongation.....	400 percent minimum.

NOTE 1: Properties to be obtained by a test method approved by the Bureau of Explosives. Other materials may be added which shall not affect the properties of this section.

§ 178.35a-2 Construction, capacity and marking.

(a) Container must be constructed in accordance with the following table:

Marked capacity not over (gallons) ²	Maximum capacity (gallons)	Minimum thickness—side wall and heads (Inches) ²	Minimum weight (pounds)
13.5.....	14.5	0.030	2
15.....	16	.030	2.25
30.....	32	.030	3.25
55.....	58	.040	5

¹ Marked (actual) capacity shall be minimum capacity.

² Side openings are not authorized.

(b) Closure: Closure shall be of material resistant to lading and adequate to prevent leakage. Vented closures where specified under Part 173 of this chapter are authorized. No opening over 2.3 inches in diameter authorized.

(c) Markings: Each container must be permanently marked with figures and letters at least ¼ inch in size to show:

(1) DOT-2SL.

(2) Name or symbol of person making the mark specified in paragraph (c) (1) of this section. Symbol, if used, must be registered with the Bureau of Explosives.

(3) Month and year of manufacture.

(4) Minimum capacity.

(d) Polyethylene container must fit snugly in outside container.

§ 178.35a-3 Type test.

(a) Samples taken at random shall withstand prescribed test without breakage. Test shall be made on each type and size at each manufacturing location

starting production and shall be repeated every four months. The type test is as follows:

(1) Empty container shall be dropped on any part from a height of 6 feet onto solid concrete immediately after conditioning for at least 24 hours at 0° F.

§ 178.35a-4 Tests.

(a) Samples taken at random, filled and prepared as specified and closed as for use, shall be capable of withstanding the following tests without leakage:

(1) The polyethylene container in a prescribed outer specification container, as authorized by Part 173 of this chapter, filled to 98 percent of capacity with water shall be dropped from a height of 4 feet onto solid concrete so as to drop diagonally on top edge or any part considered weaker.

(2) The polyethylene container in a prescribed outer specification container, as authorized by Part 173 of this chapter, filled to 98 percent of capacity with a solution which is compatible with polyethylene and remains liquid at 0° F. shall be dropped from a height of 4 feet onto solid concrete on any part of the container when container and contents are at or slightly below 0° F.

(3) The polyethylene container in a prescribed outer specification container, as authorized in Part 173 of this chapter, filled to 98 percent of capacity with water shall be capable of withstanding a vibration test by placing the container on the vibration table anchored in such manner that all horizontal motion shall be restricted and only vertical motion allowed. The test shall be performed for one hour using an amplitude of one inch at a frequency that causes the test container to be raised from the floor of the table to such a degree that a piece of paper or flat steel strap or tape can be passed between the table and the container.

Subpart C—Specifications for Cylinders

§ 178.36 Specification 3A; seamless steel cylinders or 3AX; seamless steel cylinders of capacity over 1,000 pounds water volume.

§ 178.36-1 Compliance.

(a) Required in all details.

§ 178.36-2 Type, size and service pressure.¹

(a) DOT-3A; seamless, not over 1,000 pounds water capacity (nominal) and service pressure at least 150 pounds per square inch.

(b) DOT-3AX; seamless, not less than 1,000 pounds water capacity and service pressure at least 500 pounds per square inch. Cylinders shall meet the following additional conditions:

(1) Assuming the cylinder to be supported horizontally at its two ends only and to be uniformly loaded over its entire length consisting of the weight per unit of length of the straight cylindrical portion filled with water and compressed to the specified test pressure; the sum of two times the maximum tensile stress in the bottom fibers due to bending (Note 1), plus that in the same fibers (longitudinal stress) (Note 2), due to hydrostatic test shall not exceed 80 percent of the minimum yield strength of the steel at such maximum stress. Wall thickness shall be increased when necessary to meet the requirement.

NOTE 1: To calculate the maximum longitudinal tensile stress due to bending, the following formula shall be used:

$$S = \frac{Mc}{I}$$

NOTE 2: To calculate the maximum longitudinal tensile stress due to hydrostatic test pressure, the following formula shall be used:

$$S = \frac{A_1 P}{A_2}$$

where:

S = tensile stress—p.s.i.;

M = bending moment—inch pounds $\frac{(wl^2)}{8}$;

w = weight per inch of cylinder filled with water;

l = length of cylinder—inches;

c = radius $\frac{(D)}{2}$ of cylinder—inches;

I = moment of inertia— $0.04909 (D^4 - d^4)$ inches fourth;

D = outside diameter—inches;

d = inside diameter—inches;

A₁ = internal area in cross section of cylinder—square inches;

A₂ = area of metal in cross section of cylinder—square inches;

P = hydrostatic test pressure—p.s.i.

§ 178.36-3 Inspection by whom and where.

¹ The "service pressure" limits the use of the cylinder. It is shown by marks on cylinder; for example, DOT-3A2000 indicates the service pressure as 2,000 pounds per square inch.

Inspections and verifications must be performed by an independent inspection agency. Chemical analyses and tests as specified must be made within the United States.

§ 178.36-4 Duties of inspector.

(a) Inspect all material and reject any not complying with requirements; for cylinders made by billet-piercing process, billets to be inspected after parting and shown to be free from pipe, cracks, excessive segregation and other injurious defects.

(b) Verify chemical analysis of each heat of material by analysis or by obtaining certified analysis: *Provided*, That a certificate from the manufacturer thereof, giving sufficient data to indicate compliance with requirements, is acceptable when verified by check analyses of samples taken from one cylinder out of each lot of 200 or less.

(c) Verify compliance of cylinders with all requirements including markings; inspect inside before closing in both ends; verify heat treatment as proper; obtain samples for all tests and check chemical analyses; witness all tests; verify threads by gauge; report volumetric capacity and tare weight (see report form) and minimum thickness of wall noted.

(d) Render complete report (§ 178.36-22) to purchaser and cylinder maker.

§ 178.36-5 Steel.

(a) Open-hearth or electric steel of uniform quality. Content percent for the following not over: Carbon, 0.55; phosphorous, 0.045; sulphur, 0.050.

§ 178.36-6 Identification of material.

(a) Required; any suitable method except that plates and billets for hot-drawn cylinders shall be marked with heat number.

§ 178.36-7 Defects.

(a) Material with seams, cracks, laminations, or other injurious defects, not authorized.

§ 178.36-8 Manufacture.

(a) By best appliance and methods; dirt and scale to be removed as necessary to afford proper inspection; no fissure or

other defect acceptable that is likely to weaken the finished cylinder appreciably; reasonably smooth and uniform surface finish required. If not originally free from such defects, the surface may be machined or otherwise treated to eliminate these defects. The thickness of the bottoms of cylinders welded or formed by spinning is, under no condition, to be less than two times the minimum wall thickness of the cylindrical shell; such bottom thicknesses to be measured within an area bounded by a line representing the points of contact between the cylinder and floor when the cylinder is in a vertical position.

§ 178.36-9 Welding or brazing.

(a) Welding or brazing for any purpose whatsoever is prohibited except as follows:

(1) Welding or brazing is authorized for the attachment of neckrings and footrings which are non-pressure parts and only to the tops and bottoms of cylinders having a service pressure of 500 pounds per square inch or less. Cylinders, neckrings, and footrings must be made of weldable steel, carbon content of which must not exceed 0.25 percent except in the case of 4310X steel which may be used with proper welding procedure.

(2) As permitted in § 178.36-8(a).

NOTE 1: Cylinders used solely in anhydrous ammonia service may have a 1/2 inch diameter bar welded within their concave bottoms in accordance with the foregoing requirements.

§ 178.36-10 Wall thickness.

(a) For cylinders with service pressure less than 900 pounds the wall stress shall not exceed 24,000 pounds per square inch. Minimum wall 0.100" for any cylinder over 5" outside diameter.

(b) Calculation must be made by the formula:

$$S = \frac{P(1.3D^3 + 0.4d^3)}{D^3 - d^3}$$

where

S=wall stress in pounds per square inch;

P=minimum test pressure prescribed for water jacket test or 450 pounds per square inch whichever is the greater;

D=outside diameter in inches;

d=inside diameter in inches.

§ 178.36-11 Heat treatment.

(a) The completed cylinders must be uniformly and properly heat-treated prior to tests.

§ 178.36-12 Openings in cylinders and connections (valves, fuse plugs, etc.) for those openings.

(a) Threads required, to be clean cut, even, without checks, and to gauge.

(b) Taper threads, when used, to be of length not less than as specified for American Standard taper pipe threads.

(c) Straight threads having at least 6 engaged threads are authorized; to have tight fit and calculated shear strength at least 10 times the test pressure of the cylinder; gaskets required adequate to prevent leakage.

§ 178.36-13 Safety devices and protection for valves, safety devices, and other connections, if applied.

(a) Must be as required by the Department's regulations that apply (see §§ 173.34(d) and 173.301 (g) of this chapter).

§ 178.36-14 Hydrostatic test.

(a) By water-jacket, or other suitable methods, operated so as to obtain accurate data. Pressure gauge must permit reading to accuracy of 1 percent. Expansion gauge must permit reading of total expansion to accuracy either of 1 percent or 0.1 cubic centimeter.

(b) Pressure must be maintained for 30 seconds and sufficiently longer to insure complete expansion. Any internal pressure applied after heat-treatment and previous to the official test must not exceed 90 percent of the test pressure. If, due to failure of the test apparatus the test pressure cannot be maintained the test may be repeated at a pressure increased by 10 percent or 100 pounds per square inch, whichever is the lower.

(c) Permanent, volumetric expansion must not exceed 10 percent of total volumetric expansion at test pressure.

(d) Each cylinder must be tested to at least 5/3 times service pressure.

§ 178.36-15 Flattening test.

(a) Between knife edges, wedge shaped, 60° angle, rounded to 1/2" radius; test 1 cylinder,¹ taken at random out of each lot of 200 or less, after hydrostatic test.

¹ For lots of 30 or less, physical and flattening tests are authorized to be made on a ring at least 8 inches long cut from each cylinder and subjected to same heat treatment as the finished cylinder.

§ 178.36-16 Physical test.

(a) To determine yield strength, tensile strength, elongation, and reduction of area of material. Required on 2 specimens cut from 1¹ cylinder taken at random out of each lot of 200 or less.

(b) Specimens must be: Gauge length 8 inches with width not over 1½ inches; or, gauge length 2 inches with width not over 1½ inches; provided, that gauge length at least 24 times thickness with width not over 6 times thickness is authorized when cylinder wall is not over 3/16-inch thick. The specimen, exclusive of grip ends, must not be flattened. Grip ends may be flattened to within 1 inch of each end of the reduced section. When size of cylinder does not permit securing straight specimens, the specimens may be taken in any location or direction and may be straightened or flattened cold, by pressure only, not by blows; when specimens are so taken and prepared, the inspector's report must show in connection with record of physical tests detailed information in regard to such specimens. Heating of specimen for any purpose is not authorized.

(c) The yield strength in tension shall be the stress corresponding to a permanent strain of 0.2 percent of the gauge length.

(1) The yield strength shall be determined by either the "offset" method or the "extension under load" method as prescribed in ASTM Standard E8-57T.

(2) In using the "extension under load" method, the total strain (or "extension under load") corresponding to the stress at which the 0.2 percent permanent strain occurs may be determined with sufficient accuracy by calculating the elastic extension of the gauge length under appropriate load and adding thereto 0.2 percent of the gauge length. Elastic extension calculations shall be based on an elastic modulus of 30,000,000. In the event of controversy the entire stress-strain diagram shall be plotted and the yield strength determined from the 0.2 percent offset.

(3) For the purpose of strain measurement, the initial strain shall be set while the specimen is under a stress of 12,000 pounds per square inch, the strain indicator reading being set at the calculated corresponding strain.

(4) Cross-head speed of the testing machine shall not exceed 1/8 inch per

minute during yield strength determination.

§ 178.36-17 Acceptable results for physical and flattening tests.

(a) Either of the following:

(1) Elongation at least 40 percent for 2-inch gauge length or at least 20 percent in other cases; yield strength not over 73 percent of tensile strength; flattening test not required.

(2) Elongation at least 20 percent for 2-inch gauge length or 10 percent in other cases; yield strength not over 73 percent of tensile strength; flattening required, without cracking, to 6 times wall thickness.

§ 178.36-18 Leakage test.

(a) All spun cylinders and plugged cylinders (see Notes 1 and 2) must be tested for leakage by gas or air pressure after the bottom has been cleaned and is free from all moisture. Pressure, approximately the same as but no less than service pressure, must be applied to one side of the finished bottom over an area of at least 1/16 of the total area of the bottom but not less than 3/4 inch in diameter, including the closure, for at least 1 minute, during which time the other side of the bottom exposed to pressure must be covered with water and closely examined for indications of leakage. Leakers must be rejected. (See Note 1 to § 178.36-19.)

NOTE 1: A spun cylinder is one in which an end closure in the finished cylinder has been welded by the spinning process.

NOTE 2: A plugged cylinder is one in which a permanent closure in the bottom of a finished cylinder has been effected by a plug.

NOTE 3: As a safety precaution, if the manufacturer elects to make this test before the hydrostatic test, he should design his apparatus so that the pressure is applied to the smallest area practicable, around the point of closure, and so as to use the smallest possible volume of air or gas.

§ 178.36-19 Rejected cylinders.

(a) Reheat treatment authorized; subsequent thereto, acceptable cylinders must pass all prescribed tests. Repair by welding or spinning is not authorized.

NOTE 1: Spun cylinders rejected under the provisions of § 178.36-18 may be removed from the spun cylinder category by drilling to remove defective material, tapping and plugging.

¹ See footnote on page 427.

§ 178.36-20 Marking.

(a) Marking on each cylinder by stamping plainly and permanently on shoulder, top head, or neck as follows:

(1) When cylinders are constructed to § 178.36-2(a), they shall be marked DOT-3A followed by the service pressure (for example, DOT-3A1800, etc.).

(2) When cylinders are constructed to § 178.36-2(b), they shall be marked DOT-3AX followed by the service pressure (for example DOT-3AX1800, etc.).

(3) A serial¹ number and an identifying symbol (letters); location² of number to be just below or immediately following the DOT mark; location² of symbol to just below or immediately following the number. The symbol and numbers must be those of person making DOT mark. The symbol must be registered with the Bureau of Explosives; duplications unauthorized. Examples:

DOT-3A1800
1234
XY
DOT-3A1800-1234-XY

(4) Inspector's official mark near serial number; date of test (such as 5-50 for May 1950), so placed that dates of subsequent tests can be easily added; and word "SPUN" or "PLUG" near DOT mark when an end closure in the finished cylinder has been welded by the spinning process, or effected by plugging.

§ 178.36-21 Size of marks.

(a) At least 1/4" high if space permits.

§ 178.36-22 Inspector's report.

(a) Required to be clear, legible, and in following form:

(Place) _____
(Date) _____

Gas Cylinders

Manufactured for _____ Company
Location at _____

¹ Lot numbers, not over 500 cylinders in each lot, authorized for cylinders not over 2 inches outside diameter and for cylinders over 2 inches outside diameter when the volumetric capacity does not exceed 60 cubic inches.

² Symbol in front of or following the number with ample space between is authorized. Other variation in location authorized only when necessitated by lack of space.

Gas Cylinders

Manufactured by _____ Company

Location at _____

Consigned to _____ Company

Location at _____

Quantity _____

Size _____ inches outside diameter by _____ inches long.

Marks stamped into the shoulder of the cylinder are:

Specification _____ DOT— _____

Serial numbers _____ to _____ inclusive

Inspector's mark _____

Identifying symbol (registered) _____

Test date _____

Tare weights (yes or no) _____

Other marks (if any) _____

These cylinders were made by process of _____

The _____ permitted in _____
(neckrings—footrings)

§ 178.36-9 were attached by process of _____

(welding—brazing)

The material used was identified by the following _____

(heat-purchase order)

numbers _____

The material used was verified as to chemical analysis and record thereof is attached hereto. The heat numbers _____

(were—were not)

marked on the material.

All material, such as plates, billets and seamless tubing, was inspected and each cylinder was inspected both before and after closing in the ends; all that was accepted was found free from seams, cracks, laminations, and other defects which might prove injurious to the strength of the cylinder. The processes of manufacture and heat treatment of cylinders were supervised and found to be efficient and satisfactory.

The cylinder walls were measured and the minimum thickness noted was _____ inch. The outside diameter was determined by a close approximation to be _____ inches. The wall stress was calculated to be _____ pounds per square inch under an internal pressure of _____ pounds per square inch.

Hydrostatic tests, flattening tests, tensile tests of material, and other tests, as prescribed in specification No. DOT-3A were made in the presence of the inspector and all material and cylinders accepted were found to be in compliance with the requirements of that specification. Records thereof are attached hereto.

I hereby certify that all of these cylinders proved satisfactory in every way and comply with the requirements of Department of Transportation specification No. 3A except as follows:

Exceptions: _____

(Signed) _____

Inspector.

(Place)
(Date)

RECORD OF CHEMICAL ANALYSIS OF MATERIAL FOR CYLINDERS

Numbered to inclusive.
Size inches outside diameter by inches long
Made by Company
For Company

NOTE: Any omission of analyses by heats, if authorized, must be accounted for by notation hereon reading "The prescribed certificate of the manufacturer of material has been secured, found satisfactory, and placed on file," or by attaching a copy of the certificate.

Test No.	Heat No.	Check analysis No.	Cylinders represented (serial Nos.)	Chemical analysis						
				C	P	S	Si	Mn	Ni	Cr

The analyses were made by
(Signed)
(Place)
(Date)

RECORD OF PHYSICAL TESTS OF MATERIAL FOR CYLINDERS

Numbered to inclusive.
Size inches outside diameter by inches long
Made by Company
For Company

Test No.	Cylinders represented by test (Serial Nos.)	Yield strength (pounds per square inch)	Tensile strength (pounds per square inch)	Elongation (percent in 8 inches)	Reduction of area (percent)	Flattening test
.....
.....
.....
.....

(Signed)
(Place)
(Date)

RECORD OF HYDROSTATIC TESTS ON CYLINDERS

Numbered to inclusive.
Size inches outside diameter by inches long
Made by Company
For Company

Serial numbers of cylinders tested arranged numerically	Actual test pressure (pounds per square inch)	Total expansion (cubic centimeters) ¹	Permanent expansion (cubic centimeters) ¹	Percent ratio of permanent expansion to total expansion ¹	Tare weight (pounds) ²	Volumetric capacity
.....
.....
.....
.....

¹ If the tests are made by a method involving the measurement of the amount of liquid forced into the cylinder by the test pressure, then the basic data, on which the calculations are made, such as the pump factors, temperature of liquid, coefficient of compressibility of liquid, etc., must also be given.

² Do not include removable cap but state whether with or without valve. These weights must be accurate to a tolerance of 1 percent.

(Signed)

§ 178.37 Specification 3AA; seamless steel cylinders made of definitely prescribed steels or 3AAX; seamless steel cylinders made of definitely prescribed steels of capacity over 1,000 pounds water volume.

§ 178.37-1 Compliance.

(a) Required in all details.

§ 178.37-2 Type, size and service pressure.¹

(a) DOT-3AA; seamless, not over 1,000 pounds water capacity (nominal) and service pressure at least 150 pounds per square inch.

(b) DOT-3AAX; seamless, not less than 1,000 pounds water capacity and service pressure at least 500 pounds per square inch. Cylinders shall meet the following additional conditions:

(1) Assuming the cylinder to be supported horizontally at its two ends only and to be uniformly loaded over its entire length consisting of the weight per unit of length of the straight cylindrical portion filled with water and compressed to the specified test pressure; the sum of two times the maximum tensile stress in the bottom fibers due to bending (Note 1), plus that in the same fibers (longitudinal stress) (Note 2), due to hydrostatic test shall not exceed 80 percent of the minimum yield strength of the steel at such maximum stress. Wall thickness shall be increased when necessary to meet the requirement.

NOTE 1: To calculate the maximum tensile stress due to bending, the following formula shall be used:

$$S = \frac{Mc}{I}$$

NOTE 2: To calculate the maximum longitudinal tensile stress due to hydrostatic test pressure, the following formula shall be used:

$$S = \frac{A_1 P}{A_2}$$

where:

S=tensile stress—p.s.i.;

M=bending moment—inch pounds $\frac{(wl^2)}{8}$;

¹ The "service pressure" limits the use of the cylinder. It is shown by marks on cylinder; for example, DOT-3AA2000 indicates the service pressure as 2,000 pounds per square inch.

w=weight per inch of cylinder filled with water;
l=length of cylinder—inches;

(D)
c=radius — of cylinder—inches;

(2)
I=moment of inertia—0.04909 (D⁴—d⁴) inches fourth

D=outside diameter—inches;

d=inside diameter—inches;

A₁=internal area in cross section of cylinder—square inches;

A₂=area of metal in cross section of cylinder—square inches;

P=hydrostatic test pressure—p.s.i.

§ 178.37-3 Inspection by whom and where.

Inspections and verifications must be performed by an independent inspection agency. Chemical analyses and tests as specified must be made within the United States.

§ 178.37-4 Duties of inspector.

(a) Inspect all material and reject any not complying with requirements; for cylinders made by billet-piercing process, billets to be inspected after parting and shown to be free from pipe, cracks, excessive segregation and other injurious defects.

(b) Verify chemical analysis of each heat of material by analysis or by obtaining certified analysis: *Provided* That a certificate from the manufacturer thereof, giving sufficient data to indicate compliance with requirements is acceptable when verified by check analyses of samples taken from one cylinder out of each lot of 200 or less.

(c) Verify compliance of cylinders with all requirements including markings; inspect inside before closing in both ends; verify heat treatment as proper; obtain samples for all tests and check chemical analyses; witness all tests; verify threads by gauge; report volumetric capacity and tare weight (see report form) and minimum thickness of wall noted.

(d) Render complete report (§ 178.37-22) to purchaser and cylinder maker.

§ 178.37-5 Authorized steel.

(a) Open-hearth, basic oxygen, or electric steel of uniform quality. The following chemical analyses are authorized (see note 1):

Designation	4130X (percent) (see note 2)	NE-8630 (per- cent) (see note 2)	9115 (percent) (see note 2)	9125 (percent) (see note 2)
Carbon.....	0.25-0.35.....	0.28/0.33.....	0.10-0.20.....	0.20-0.30.....
Manganese.....	0.40-0.90.....	0.70-0.90.....	0.50-0.75.....	0.50-0.75.....
Phosphorus.....	0.04 max.....	0.04 max.....	0.04 max.....	0.04 max.....
Sulphur.....	0.05 max.....	0.04 max.....	0.04 max.....	0.04 max.....
Silicon.....	0.20-0.35.....	0.20-0.35.....	0.60-0.90.....	0.60-0.90.....
Chromium.....	0.80-1.10.....	0.40-0.60.....	0.50-0.65.....	0.50-0.65.....
Molybdenum.....	0.15-0.25.....	0.15-0.25.....		
Zirconium.....			0.05-0.15.....	0.05-0.15.....
Nickel.....		0.40-0.70.....		

Designation	9115X (percent) (see note 2)	9125X (percent) (see note 2)	Intermediate manganese (percent)
Carbon.....	0.10-0.20.....	0.20-0.30.....	0.40 max.....
Manganese.....	0.50-0.75.....	0.50-0.75.....	1.35-1.65.....
Phosphorus.....	0.04 max.....	0.04 max.....	0.04 max.....
Sulphur.....	0.04 max.....	0.04 max.....	0.05 max.....
Silicon.....	0.60-0.90.....	0.60-0.90.....	0.10-0.30.....
Chromium.....	0.50-0.65.....	0.50-0.65.....	
Molybdenum.....	0.10-0.20.....	0.10-0.20.....	
Zirconium.....	0.05-0.15.....	0.05-0.15.....	
Nickel.....			

NOTE 1: A heat of steel made under the above specifications, check chemical analysis of which is slightly out of the specified range, is acceptable, if satisfactory in all other respects, provided the tolerances shown in the following tables are not exceeded, except as approved by the Department:

CHECK ANALYSIS TOLERANCES

Element	Limit or maximum specified (percent)	Tolerance (percent) over the maximum limit or under the minimum limit	
		Under mini- mum limit	Over maxi- mum limit
Carbon.....	To 0.15 incl.....	0.02	0.03
	Over 0.15 to 0.40 incl.....	.03	.04
Manganese.....	To 0.60 incl.....	.03	.03
	Over 0.60 to 1.15 incl.....	.04	.04
	Over 1.15 to 2.50 incl.....	.05	.05
Phosphorus ¹	All ranges.....		.01
Sulphur.....	do.....		.01
Silicon.....	To 0.30 incl.....	.02	.03
	Over 0.30 to 1.00 incl.....	.05	.05
Nickel.....	To 1.00 incl.....	.03	.03
Chromium.....	To 0.90 incl.....	.03	.03
	Over 0.90 to 2.10 incl.....	.05	.05
Molybdenum.....	To 0.20 incl.....	.01	.01
	Over 0.20 to 0.40.....	.02	.02
Zirconium.....	All ranges.....	.01	.05

¹ Rephosphorized steels not subject to check analysis for phosphorus.

NOTE 2: This designation shall not be restrictive and the commercial steel is limited in analysis as shown in the table.

§ 178.37-6 Identification of material.

(a) Required; any suitable method except that plates and billets for hot-drawn

cylinders shall be marked with heat number.

§ 178.37-7 Defects.

(a) Material with seams, cracks, laminations, or other injurious defects, not authorized.

§ 178.37-8 Manufacture.

(a) By best appliances and methods; dirt and scale to be removed as necessary to afford proper inspection; no fissure or other defects acceptable that is likely to weaken the finished cylinder appreciably; reasonably smooth and uniform surface finish required. If not originally free from such defects, the surface may be machined or otherwise treated to eliminate these defects. The thickness of the bottoms of cylinders welded or formed by spinning is, under no condition, to be less than two times the minimum wall thickness of the cylindrical shell; such bottom thicknesses to be measured within an area bounded by a line representing the points of contact between the cylinder and floor when the cylinder is in a vertical position.

§ 178.37-9 Welding or brazing.

(a) Welding or brazing for any purpose whatsoever is prohibited except as follows:

(1) Welding or brazing is authorized for the attachment of neckrings and footrings which are non-pressure parts, and only to the tops and bottoms of cylinders having a service pressure of 500 pounds per square inch or less. Cylinders, neckrings, and footrings must be made of weldable steel, carbon content of which must not exceed 0.25 percent except in the case of 4130X steel which may be used with proper welding procedure.

(2) As permitted in § 178.37-8.

§ 178.37-10 Wall thickness.

(a) For cylinders with service pressure less than 900 pounds the wall stress shall not exceed 24,000 pounds per square inch. Minimum wall 0.100" for any cylinder over 5" outside diameter.

(b) For cylinders with service pressure of 900 p.s.i. or more the minimum wall shall be such that the wall stress at the minimum specified test pressure shall not exceed 67 percent of the minimum tensile strength of the steel as determined from the physical tests required in

§§ 178.37-16 and 178.37-17 and shall be not over 70,000 p.s.i.

(c) Calculation must be made by the formula:

$$S = \frac{P(1.3D^2 + 0.4d^2)}{D^2 - d^2}$$

where

S = wall stress in pounds per square inch;
 P = minimum test pressure prescribed for water jacket test of 450 pounds per square inch whichever is the greater;
 D = outside diameter in inches;
 d = inside diameter in inches.

§ 178.37-11 Heat treatment.

(a) The completed cylinders must be uniformly and properly heat treated prior to tests. Heat treatment of cylinders of the authorized analyses shall be as follows:

(1) All cylinders must be quenched by oil, or other suitable medium except as provided in subparagraph (5) of this paragraph.

(2) The steel temperature on quenching shall be that recommended for the steel analysis, but in no case shall exceed 1750° F.

(3) All steels shall be tempered at a temperature most suitable for that steel.

(4) The minimum tempering temperature shall be not less than 1000° F. except as noted in subparagraph (6) of this paragraph.

(5) Steel 4130X may be normalized at a temperature of 1650° F. instead of being quenched and cylinders so normalized need not be tempered.

(6) Intermediate manganese steels may be tempered at temperatures not less than 1150° F., and after heat treating each cylinder must be submitted to a magnetic test to detect the presence of quenching cracks. Cracked cylinders shall be rejected and destroyed.

(7) [Reserved]

(8) Except as otherwise provided in subparagraph (6) of this paragraph, all cylinders, if water quenched or quenched with a liquid producing a cooling rate in excess of 80 percent of the cooling rate of water, must be inspected by the magnetic particle, dye penetrant or ultrasonic method to detect the presence of quenching cracks. Any cylinder designed to the requirements for specification 3AA and found to have a quenching crack must be rejected and may not be requalified. Cylinders designed to the requirements for specification 3AAX and found to have cracks must have cracks removed to sound metal by mechanical means.

Such specification 3AAX cylinders will be acceptable if the repaired area is subsequently examined to assure no defect, and it is determined that design thickness requirements are met.

§ 178.37-12 Openings in cylinders and connections (valves, fuse plugs, etc.) for those openings.

(a) Threads required, to be clean cut, even, without checks, and to gauge.

(b) Taper threads, when used, to be of length not less than as specified for American Standard taper pipe threads.

(c) Straight threads having at least 6 engaged threads are authorized; to have tight fit and calculated shear strength at least 10 times the test pressure of the cylinder; gaskets required, adequate to prevent leakage.

§ 178.37-13 Safety devices and protection for valves, safety devices and other connections, if applied.

(a) Must be as required by the Department of Transportation's regulations that apply (see §§ 173.34(d) and 173.301(g) of this chapter).

§ 178.37-14 Hydrostatic test.

(a) By water-jacket, or other suitable method, operated so as to obtain accurate data. Pressure gauge must permit reading to accuracy of 1 percent. Expansion gauge must permit reading of total expansion to accuracy either of 1 percent or 0.1 cubic centimeter.

(b) Pressure must be maintained for 30 seconds and sufficiently longer to insure complete expansion. Any internal pressure applied after heat-treatment and previous to the official test must not exceed 90 percent of the test pressure. If, due to failure of the test apparatus, the test pressure cannot be maintained, the test may be repeated at a pressure increased by 10 percent or 100 pounds per square inch, whichever is the lower.

(c) Permanent volumetric expansion must not exceed 10 percent of total volumetric expansion at test pressure.

(d) Each cylinder must be tested to at least $5/3$ times service pressure.

§ 178.37-15 Flattening test.

(a) Between knife edges, wedge shaped, 60° angle, rounded to $1/2''$ radius; test 1 cylinder¹ taken at random out of each lot of 200 or less, after hydrostatic test.

§ 178.37-16 Physical test.

(a) To determine yield strength, tensile strength, elongation, and reduction of area of material. Required on 2 specimens cut from 1¹ cylinder taken at random out of each lot of 200 or less.

(b) Specimens must be: Gauge length 8 inches with width not over $1\frac{1}{2}$ inches; or, gauge length 2 inches with width not over $1\frac{1}{2}$ inches: *Provided*, That gauge length at least 24 times thickness with width not over 6 times thickness is authorized when cylinder wall is not over $3/16$ inch thick. The specimen, exclusive of grip ends, must not be flattened. Grip ends may be flattened to within one inch of each end of the reduced section. When size of cylinder does not permit securing straight specimens, the specimens may be taken in any location or direction and may be straightened or flattened cold, by pressure only, not by blows; when specimens are so taken and prepared, the inspector's report must show in connection with record of physical tests detailed information in regard to such specimens. Heating of specimen for any purpose is not authorized.

(c) The yield strength in tension shall be the stress corresponding to a permanent strain of 0.2 percent of the gauge length.

(1) The yield strength shall be determined by either the "offset" method or the "extension under load" method as prescribed in ASTM Standard E8-57T.

(2) In using the "extension under load" method, the total strain (or "extension under load") corresponding to the stress at which the 0.2 percent permanent strain occurs may be determined with sufficient accuracy by calculating the elastic extension of the gauge length under appropriate load and adding thereto 0.2 percent of the gauge length.

¹ For lots of 30 or less, physical and flattening tests are authorized to be made on a ring at least 8 inches long cut from each cylinder and subjected to same heat treatment as the finished cylinder.

Elastic extension calculations shall be based on an elastic modulus of 30,000,000. In the event of controversy, the entire stress-strain diagram shall be plotted and the yield strength determined from the 0.2 percent offset.

(3) For the purpose of strain measurement, the initial strain shall be set while the specimen is under a stress of 12,000 pounds per square inch, the strain indicator reading being set at the calculated corresponding strain.

(4) Cross-head speed of the testing machine shall not exceed $\frac{1}{8}$ inch per minute during yield strength determination.

§ 178.37-17 Physical and flattening tests.

(a) Acceptable results for physical and flattening tests; elongation at least 20 percent for 2" gauge length or at least 10 percent in other cases; flattening required without cracking to 6 times wall thickness.

§ 178.37-18 Leakage test.

(a) All spun cylinders and plugged cylinders (See Notes 1 and 2) must be tested for leakage by gas or air pressure after the bottom has been cleaned and is free from all moisture. Pressure, approximately the same as but no less than service pressure, must be applied to one side of the finished bottom over an area of at least $\frac{1}{16}$ of the total area of the bottom but not less than $\frac{3}{4}$ inch in diameter, including the closure, for at least one minute, during which time the other side of the bottom exposed to pressure must be covered with water and closely examined for indications of leakage. Leakers must be rejected. (See Note 1 to § 178.37-19.)

NOTE 1: A spun cylinder is one in which an end closure in the finished cylinder has been welded by the spinning process.

NOTE 2: A plugged cylinder is one in which a permanent closure in the bottom of a finished cylinder has been effected by a plug.

NOTE 3: As a safety precaution, if the manufacturer elects to make this test before the hydrostatic test, he should design his apparatus so that the pressure is applied to the smallest area practicable, around the point of closure, and so as to use the smallest possible volume of air or gas.

§ 178.37-19 Rejected cylinders.

(a) Reheat treatment authorized; subsequent thereto, acceptable cylinders

must pass all prescribed tests. Repair by welding or spinning is not authorized.

NOTE 1: Spun cylinders rejected under the provision of § 178.37-18 may be removed from the spun cylinder category by drilling to remove defective material, tapping and plugging.

§ 178.37-20 Marking.

(a) Marking on each cylinder by stamping plainly and permanently on shoulder, top head, or neck as follows:

(1) When cylinders are constructed to § 178.37-2(a), they shall be marked DOT-3AA followed by the service pressure (for example, DOT-3AA1800, etc.).

(2) When cylinders are constructed to § 178.37-2(b), they shall be marked DOT-3AAX followed by the service pressure (for example, DOT-3AAX1800, etc.).

(3) A serial¹ number and an identifying symbol (letters); location² of number to be just below or immediately following the DOT mark; location² of symbol to be just below or immediately following the number. The symbol and numbers must be those of person making DOT mark. The symbol must be registered with the Bureau of Explosives; duplications unauthorized. Examples:

DOT-3AA1800

1234

XY

DOT-3AA1800-1234-XY

(4) Inspector's official mark near serial number; date of test (such as 5-50 for May 1950), so placed that dates of subsequent tests can be easily added; and word "SPUN" or "PLUG" near DOT mark when an end closure in the finished cylinder has been welded by the spinning process, or effected by plugging.

§ 178.37-21 Size of marks.

(a) At least $\frac{1}{4}$ " high if space permits.

¹ Lot numbers, not over 500 cylinders in each lot, authorized for cylinders not over 2 inches outside diameter and for cylinders over 2 inches outside diameter when the volumetric capacity does not exceed 60 cubic inches.

² Symbol in front of or following the number with ample space between is also authorized. Other variation in location authorized only when necessitated by lack of space.

§ 178.37-22 Inspector's report.

(a) Required to be clear, legible, and in the following form:

(Place) _____
(Date) _____

Gas Cylinders

Manufactured for _____ Company
Location at _____
Manufactured by _____ Company
Location at _____
Consigned to _____ Company
Location at _____
Quantity _____
Size _____ inches outside diameter
by _____ inches long.

Marks stamped into the shoulder of the cylinder are:

Specification DOT _____
Serial numbers _____ to _____ inclusive
Inspector's mark _____
Identifying symbol (registered) _____
Test date _____
Tare weights (yes or no) _____
Other marks (if any) _____
These cylinders were made by process of _____

The cylinders were heat treated by the process of _____

The _____ per-
(neckrings—footrings)
mitted in § 178.37-9 were attached by process
of _____

(welding—brazing)
The material used was identified by the
following _____

(heat-purchase order)
numbers _____

The material used was verified as to chemical analysis and record thereof is attached

hereto. The heat numbers _____
(were—were not)
marked on the material.

All material, such as plates, billets and seamless tubing, was inspected and each cylinder was inspected both before and after closing in the ends; all that was accepted was found free from seams, cracks, laminations, and other defects which might prove injurious to the strength of the cylinder. The processes of manufacture and heat treatment of cylinders were supervised and found to be efficient and satisfactory.

The cylinder walls were measured and the minimum thickness noted was _____ inch. The outside diameter was determined by a close approximation to be _____ inches. The wall stress was calculated to be _____ pounds per square inch under an internal pressure of _____ pounds per square inch.

Hydrostatic tests, flattening tests, tensile tests of material, and other tests, as prescribed in specification No. DOT-3AA were made in the presence of the inspector and all material and cylinders accepted were found to be in compliance with the requirements of that specification. Records thereof are attached hereto.

I hereby certify that all of these cylinders proved satisfactory in every way and comply with the requirements of Department of Transportation specification No. 3AA except as follows:

Exceptions: _____

(Signed) _____
Inspector.

(Place) _____
(Date) _____

RECORD OF CHEMICAL ANALYSIS OF MATERIAL FOR CYLINDERS

Numbered _____ to _____ inclusive.
Size _____ inches outside diameter by _____ inches long
Made by _____ Company
For _____ Company

NOTE. Any omission of analyses by heats, if authorized, must be accounted for by notation hereon reading "The prescribed certificate of the manufacturer of material has been secured, found satisfactory, and placed on file," or by attaching a copy of the certificate.

Test No.	Heat No.	Check analysis No.	Cylinders represented (serial Nos.)	Chemical analysis								
				C	P	S	Si	Mn	Ni	Cr	Mo	Zr
									</			

The analyses were made by _____
(Signed) _____

(Place)
(Date)

RECORD OF PHYSICAL TESTS OF MATERIAL FOR CYLINDERS

Numbered to inclusive.
Size inches outside diameter by inches long
Made by Company
For Company

Test No.	Cylinders represented by test (serial Nos.)	Yield strength at 0.2 percent offset (pounds per square inch)	Tensile strength (pounds per square inch)	Elongation (percent in 8 inches)	Reduction of area (percent)	Flattening test

(Signed)

(Place)
(Date)

RECORD OF HYDROSTATIC TESTS ON CYLINDERS

Numbered to inclusive.
Size inches outside diameter by inches long
Made by Company
For Company

Serial Nos. of cylinders tested arranged numerically	Actual test pressure (pounds per square inch)	Total expansion (cubic centimeters) ¹	Permanent expansion (cubic centimeters) ¹	Percent ratio of permanent expansion to total expansion ¹	Tare weight (pounds) ²	Volumetric capacity ²

¹ If the tests are made by a method involving the measurement of the amount of liquid forced into the cylinder by the test pressure, then the basic data, on which the calculations are made, such as the pump factors temperature of liquid, coefficient of compressibility of liquid, etc., must also be given.

² Do not include removable cap but state whether with or without valve. These weights must be accurate to a tolerance of 1 percent.

(Signed)

§ 178.38 Specification 3B; seamless steel cylinders.

§ 178.38-3 Inspection by whom and where.

§ 178.38-1 Compliance.

(a) Required in all details.

§ 178.38-2 Type, size, and service pressure.

(a) *Type and size.* Seamless; not over 1,000 pounds water capacity (nominal).

(b) *Service pressure.*¹ At least 150 to not over 500 pounds per square inch.

Inspections and verifications must be performed by an independent inspection agency or in the case of cylinders manufactured in the United States, a competent inspector of the manufacturer. Chemical analyses and tests as specified must be made within the United States.

¹ The "service pressure" limits the use of the cylinder. It is shown by marks on cylinder; for example, DOT-3B300 indicates the service pressure as 300 pounds per square inch.

§ 178.38-4 Duties of inspector.

(a) Inspect all material and reject any not complying with requirements; for cylinders made by billet-piercing process, billets to be inspected after nick and cold break.

(b) Verify chemical analysis of each heat of material by analysis or by obtaining certified analysis: *Provided*, That a certificate from the manufacturer thereof, giving sufficient data to indicate compliance with requirements, is acceptable when verified by check analyses of samples taken from one cylinder out of each lot of 200 or less.

(c) Verify compliance of cylinders with all requirements including markings; inspect inside before closing in both ends; verify heat treatment as proper; obtain samples for all tests and check chemical analyses; witness all tests; verify threads by gauge; report volumetric capacity and tare weight (see report form) and minimum thickness of wall noted.

(d) Render complete report (§ 178.38-22) to purchaser and cylinder maker.

§ 178.38-5 Steel.

(a) Open-hearth or electric steel of uniform quality. Content percent for the following not over: Carbon, 0.55; phosphorus, 0.045; sulphur, 0.050.

§ 178.38-6 Identification of material.

(a) Required; any suitable method except that plates and billets for hot-drawn cylinders shall be marked with heat number.

§ 178.38-7 Defects.

(a) Material with seams, racks, laminations, or other injurious defects, not authorized.

§ 178.38-8 Manufacture.

(a) By best appliances and methods; dirt and scale to be removed as necessary to afford proper inspection; no fissure or other defect acceptable that is likely to weaken the finished cylinder appreciably; reasonably smooth and uniform surface finish required. If not originally free from such defects, the surface may be machined or otherwise treated to eliminate these defects. The thickness of the bottoms of cylinders welded or formed by spinning is, under no condition, to be less than two times the mini-

mum wall thickness of the cylindrical shell; such bottom thicknesses to be measured within an area bounded by a line representing the points of contact between the cylinder and floor when the cylinder is in a vertical position.

§ 178.38-9 Welding or brazing.

(a) Welding or brazing for any purpose whatsoever is prohibited except as follows:

(1) Welding or brazing is authorized for the attachment of neckrings and footrings which are non-pressure parts, and only to the tops and bottoms of cylinders having a service pressure of 500 pounds per square inch or less. Cylinders, neckrings, and footrings must be made of weldable steel, carbon content of which must not exceed 0.25 percent except in the case of 4130X steel which may be used with proper welding procedure.

(2) As permitted in § 178.38-8.

§ 178.38-10 Wall thickness.

(a) The wall stress shall not exceed 24,000 pounds per square inch. Minimum wall 0.090" for any cylinder over 6" outside diameter.

(b) Calculation must be made by the formula:

$$S = \frac{P(1.3D^3 + 0.4d^2)}{D^2 - d^3}$$

where

S=wall stress in pounds per square inch;

P=minimum test pressure prescribed for water jacket test or 450 pounds per square inch whichever is the greater;

D=outside diameter in inches;

d=inside diameter in inches.

§ 178.38-11 Heat treatment.

(a) The completed cylinders must be uniformly and properly heat-treated prior to tests.

§ 178.38-12 Openings in cylinders and connections (valves, fuse plugs, etc.) for those openings.

(a) Threads required to be clean cut even, without checks, and to gauge.

(b) Taper threads when used, to be of length not less than as specified for American Standard taper pipe threads.

(c) Straight threads having at least 4 engaged threads are authorized; to have tight fit, and calculated shear strength at least 10 times the test pressure of the cylinder; gaskets required, adequate to prevent leakage.

§ 178.38-13 Safety devices and protection for valves, safety devices, and other connections, if applied.

(a) Must be as required by the Department's regulations that apply (see §§ 173.34(d), 173.301(g) and 173.124(a) of this chapter).

§ 178.38-14 Hydrostatic test.

(a) By water-jacket, or other suitable method, operated so as to obtain accurate data. Pressure gauge must permit reading to accuracy of 1 percent. Expansion gauge must permit reading of total expansion to accuracy either of 1 percent or 0.1 cubic centimeter.

(b) Pressure must be maintained for 30 seconds and sufficiently longer to insure complete expansion. Any internal pressure applied after heat-treatment and previous to the official test must not exceed 90 percent of the test pressure. If, due to failure of the test apparatus, the test pressure cannot be maintained, the test may be repeated at a pressure increased by 10 percent or 100 pounds per square inch, whichever is the lower.

(c) Permanent volumetric expansion must not exceed 10 percent of total volumetric expansion at test pressure.

(d) Cylinders must be tested as follows:

(1) Each cylinder; to at least 2 times service pressure.

(2) Or, 1 cylinder out of each lot of 200 or less; to at least 3 times service pressure. Others must be examined under pressure of 2 times service pressure and show no defect.

§ 178.38-15 Flattening test.

(a) Between knife edges, wedge shaped, 60° angle, rounded to $\frac{1}{2}$ " radius; test 1 cylinder¹ taken at random out of each lot of 200 or less, after hydrostatic test.

§ 178.38-16 Physical test.

(a) To determine yield strength, tensile strength, elongation, and reduction of area of material. Required on 2 specimens cut from 1¹ cylinder taken at random out of each lot of 200 or less.

¹ For lots of 30 or less physical and flattening tests are authorized to be made on a ring at least 8 inches long cut from each cylinder and subjected to same heat treatment as the finished cylinder.

(b) Specimens must be: Gauge length 8 inches with width not over $1\frac{1}{2}$ inches; or, gauge length 2 inches with width not over $1\frac{1}{2}$ inches: *Provided*, That gauge length at least 24 times thickness with width not over 6 times thickness is authorized when cylinder wall is not over $\frac{3}{16}$ inch thick. The specimen, exclusive of grip ends, must not be flattened. Grip ends may be flattened to within one inch of each end of the reduced section. When size of cylinder does not permit securing straight specimens, the specimens may be taken in any location or direction and may be straightened or flattened cold, by pressure only, not by blows; when specimens are so taken and prepared, the inspector's report must show in connection with record of physical tests detailed information in regard to such specimens. Heating of specimen for any purpose is not authorized.

(c) The yield strength in tension shall be the stress corresponding to a permanent strain of 0.2 percent of the gauge length.

(1) The yield strength shall be determined by either the "offset" method or the "extension under load" method as prescribed in ASTM Standard E8-57T.

(2) In using the "extension under load" method, the total strain (or "extension under load") corresponding to the stress at which the 0.2 percent permanent strain occurs may be determined with sufficient accuracy by calculating the elastic extension of the gauge length under appropriate load and adding thereto 0.2 percent of the gauge length. Elastic extension calculations shall be based on an elastic modulus of 30,000,000. In the event of controversy, the entire stress-strain diagram shall be plotted and the yield strength determined from the 0.2 percent offset.

(3) For the purpose of strain measurement, the initial strain shall be set while the specimen is under a stress of 12,000 pounds per square inch, the strain indicator reading being set at the calculated corresponding strain.

(4) Cross-head speed of the testing machine shall not exceed $\frac{1}{8}$ inch per minute during yield strength determination.

§ 178.38-17 Acceptable results for physical and flattening tests.

(a) Either of the following:

(1) Elongation at least 40 percent for 2-inch gauge length or at least 20 per-

cent in other cases; yield strength not over 73 percent of tensile strength; flattening test not required.

(2) Elongation at least 20 percent for 2-inch gauge length or 10 percent in other cases; yield strength not over 73 percent of tensile strength; flattening required, without cracking to 6 times wall thickness.

§ 178.38-18 Leakage test.

(a) All spun cylinders and plugged cylinders (see Notes 1 and 2) must be tested for leakage by gas or air pressure after the bottom has been cleaned and is free from all moisture. Pressure, approximately the same as but no less than service pressure, must be applied to one side of the finished bottom over an area of at least $\frac{1}{16}$ of the total area of the bottom but not less than $\frac{3}{4}$ inch in diameter, including the closure, for at least one minute, during which time the other side of the bottom exposed to pressure must be covered with water and closely examined for indications of leakage. Leakers must be rejected. (See Note 1 to § 178.38-19.)

NOTE 1: A spun cylinder is one in which an end closure in the finished cylinder has been welded by the spinning process.

NOTE 2: A spun cylinder is one in which a permanent closure in the bottom of a finished cylinder has been effected by a plug.

NOTE 3: As a safety precaution, if the manufacturer elects to make this test before the hydrostatic test, he should design his apparatus so that the pressure is applied to the smallest area practicable, around the point of closure, and so as to use the smallest possible volume of air or gas.

§ 178.38-19 Rejected cylinders.

(a) Reheat treatment authorized, subsequent thereto, acceptable cylinders must pass all prescribed tests. Repair by welding or spinning is not authorized.

NOTE 1: Spun cylinders rejected under the provisions of § 178.38-18 may be removed from the spun cylinder category by drilling to remove defective material, tapping and plugging.

§ 178.38-20 Marking.

(a) Marking on each cylinder by stamping plainly and permanently on shoulder, top head, or neck as follows:

(1) DOT-3B followed by the service pressure (for example, DOT-3B300, etc.).

(2) A serial¹ number and an identifying symbol (letters); location² of number to be just below or immediately following the DOT mark; location² of symbol to be just below or immediately following the number. The symbol and numbers must be those of person making DOT mark. The symbol must be registered with the Bureau of Explosives; duplications unauthorized.

Examples:

DOT-3B300
1234
XY
DOT-3B300-1234-XY

(3) Inspector's official mark near serial number; date of test (such as 5-50 for May 1950), so placed that dates of subsequent tests can be easily added; and word "SPUN" or "PLUG" near DOT mark when an end closure in the finished cylinder has been welded by the spinning process, or effected by plugging.

(b) Marking stamped into the side-walls of cylinders having a service pressure of 150 psi is permitted only if all of the following conditions are met:

(1) Wall stress at test pressure shall not exceed 24,000 psi.

(2) Minimum wall thickness shall be not less than 0.090".

(3) Depth of stamping shall be no greater than 15 percent of the minimum wall thickness, but at no time shall it exceed 0.015".

(4) Maximum outside diameter of cylinder shall not exceed 5".

(5) Carbon content of cylinder shall not exceed 0.25 percent. If the carbon content exceeds 0.25 percent, the complete cylinder must be normalized after stamping.

(6) Stamping shall be adjacent to top head.

¹ Lot numbers, not over 500 cylinders in each lot, authorized for cylinders not over 2 inches outside diameter and for cylinders over 2 inches outside diameter when the volumetric capacity does not exceed 170 cubic inches.

² Symbol in front of or following the number with ample space between is also authorized. Other variation in location authorized only when necessitated by lack of space.

§ 178.38-21 Size of marks.

(a) At least $\frac{1}{4}$ " high if space permits.

§ 178.38-22 Inspector's report.

(a) Required to be clear, legible, and in following form:

Example:

DOT-3B300
1234
XY
(Place) _____
(Date) _____
Gas cylinders
Manufactured for _____ Company
Location at _____
Manufactured by _____ Company
Location at _____
Consigned to _____ Company
Location at _____
Quantity _____
Size _____ inches outside diameter by _____ inches long.
Marks stamped into the shoulder of the cylinder are:
Specification DOT- _____
Serials numbers _____ to _____ inclusive.
Inspector's mark _____
Identifying symbol (registered) _____
Test date _____
Tare weights (yes or no) _____
Other marks (if any) _____
These cylinders were made by process of _____
_____ permitted
The _____ (neckrings-footrings)
in § 178.38-9 were attached by process of _____
_____ (welding-brazing)

The material used was identified by the following _____ numbers
(heat-purchase order)

The material used was verified as to chemical analysis and record thereof is attached hereto. The heat numbers _____
(were—were not)

marked on the material.

All material, such as plates, billets and seamless tubing, was inspected and each cylinder was inspected both before and after closing in the ends; all that was accepted was found free from seams, cracks, laminations, and other defects which might prove injurious to the strength of the cylinder. The processes of manufacture and heat treatment of cylinders were supervised and found to be efficient and satisfactory.

The cylinder walls were measured and the minimum thickness noted was _____ inch. The outside diameter was determined by a close approximation to be _____ inches. The wall stress was calculated to be _____ pounds per square inch under an internal pressure of _____ pounds per square inch.

Hydrostatic tests, flattening tests, tensile tests of material, and other tests, as prescribed in specification No. DOT-3B were made in the presence of the inspector and all material and cylinders accepted were found to be in compliance with the requirements of that specification. Records thereof are attached hereto.

I hereby certify that all of these cylinders proved satisfactory in every way and comply with the requirements of Department of Transportation specification No. 3B except as follows:

Exceptions _____

(Signed) _____
Inspector

(Place) _____
(Date) _____

RECORD OF CHEMICAL ANALYSIS OF MATERIAL FOR CYLINDERS

Numbered _____ to _____ inclusive.
Size _____ inches outside diameter by _____ inches long
Made by _____ Company
For _____ Company

NOTE: Any omission of analyses by heats, if authorized, must be accounted for by notation hereon reading "The prescribed certificate of the manufacturer of material has been secured, found satisfactory, and placed on file," or by attaching a copy of the certificate.

Test No.	Heat No.	Check analysis No.	Cylinders represented (serial Nos.)	Chemical analysis						
				C	P	S	Si	Mn	Ni	Cr

The analyses were made by _____
(Signed) _____

(Place).....
(Date).....

RECORD OF PHYSICAL TESTS OF MATERIAL FOR CYLINDERS

Numbered 'o inclusive.
Size inches outside diameter by inches long
Made by Company
For Company

[illegible]

(Signed)

(Place)
(Date)

RECORD OF HYDROSTATIC TESTS ON CYLINDERS

Numbered to inclusive.
Size inches outside diameter by inches long
Made by Company
For Company

[illegible]

NOTE. When specifications require test for only 1 out of each lot of 200 or less cylinders, the check on the others must be indicated by a notation hereon reading, "Each cylinder was subjected to a pressure of.....pounds per square inch and showed no defect."

¹ If the tests are made by a method involving the measurement of the amount of liquid forced into the cylinder by the test pressure, then the basic data on which the calculations are made, such as the pump factors, temperature of liquid, coefficient of compressibility of liquid, etc. must also be given.

² Do not include removable cap but state whether with or without valve. These weights must be accurate to a tolerance of 1 percent.

³ Report approximate maximum and minimum volumetric capacity for the lot.

(Signed)

§ 178.39 Specification 3BN; seamless nickel cylinders.

§ 178.39-3 Inspection by whom and where.

§ 178.39-1 Compliance.

(a) Required in all details.

§ 178.39-2 Type, size and service pressure.

(a) *Type and size.* Seamless; not over 125 pounds water capacity (nominal).

(b) *Service pressure.*¹ At least 150 to not over 500 pounds per square inch.

Inspections and verifications must be performed by an independent inspection agency or, in the case of cylinders manufactured in the United States, a competent inspector of the manufacturer. Chemical analyses and tests as specified must be made within the United States.

¹ The "service pressure" limits the use of the cylinder. It is shown by marks on cylinder; for example, DOT-3BN400 indicates the service pressure as 400 pounds per square inch.

§ 178.39-4 Duties of inspector.

(a) Inspect all material and reject any not complying with requirements.

(b) Verify chemical analysis of each heat of material by analysis or by obtaining certified analysis: *Provided*, That a certificate from the manufacturer thereof, giving sufficient data to indicate compliance with requirements, is acceptable when verified by check analyses of samples taken from one cylinder out of each lot of 200 or less.

(c) Verify compliance of cylinders with all requirements including markings; inspect inside before closing in both ends; verify heat treatment as proper; obtain samples for all tests and check chemical analyses; witness all tests, verify threads by gauge; report volumetric capacity and tare weight (see report form) and minimum thickness of wall noted.

(d) Render complete report (§ 178.39-21) to purchaser and cylinder maker.

§ 178.39-5 Nickel.

(a) At least 99.0 percent pure nickel plus cobalt.

§ 178.39-6 Identification of material.

(a) Required; any suitable method except that plates and billets for hot-drawn cylinders shall be marked with heat number.

§ 178.39-7 Defects.

(a) Material with seams, cracks, laminations, or other injurious defects, not authorized.

§ 178.39-8 Manufacture.

(a) By best appliances and methods; dirt and scale to be removed as necessary to afford proper inspection; no defect acceptable that is likely to weaken the finished cylinder appreciably; reasonably smooth and uniform surface finish required. Cylinders closed in by spinning process not authorized.

§ 178.39-9 Welding or brazing.

(a) Welding or brazing for any purpose whatsoever is prohibited except that welding is authorized for the attachment of neckrings and footrings which are nonpressure parts, and only to the tops and bottoms of cylinders. Neckrings and footrings must be of weldable material,

carbon content of which must not exceed 0.25 percent Nickel welding rod must be used.

§ 178.39-10 Wall thickness.

(a) The wall stress shall not exceed 15,000 pounds per square inch. Minimum wall 0.100" for any cylinder over 5" outside diameter.

(b) Calculation must be made by the formula:

$$S = \frac{P(1.3D^3 + 0.4d^2)}{D^2 - d^2}$$

where

S=wall stress in pounds per square inch;

P=minimum test pressure prescribed for water jacket test or 450 pounds per square inch whichever is the greater;

D=outside diameter in inches;

d=inside diameter in inches.

§ 178.39-11 Heat treatment.

(a) The completed cylinders must be uniformly and properly heat-treated prior to tests.

§ 178.39-12 Openings in cylinders and connections (valves, fuse plugs, etc.) for those openings.

(a) Threads required, to be clean cut, even, without checks, and to gauge.

(b) Taper threads, when used, to be of length not less than as specified for American Standard taper pipe threads.

(c) Straight threads having at least 6 engaged threads are authorized; to have tight fit and calculated shear strength at least 10 times the test pressure of the cylinder; gaskets required, adequate to prevent leakage.

§ 178.39-13 Safety devices and protection for valves, safety devices, and other connections, if applied.

(a) Must be as required by the Department's regulations that apply (see §§ 173.34(d) and 173.301(g) of this chapter).

§ 178.39-14 Hydrostatic test.

(a) By water-jacket, or other suitable method, operated so as to obtain accurate data. Pressure gauge must permit reading to accuracy of 1 percent. Expansion gauge must permit reading of total expansion to accuracy either of 1 percent or 0.1 cubic centimeter.

(b) Pressure must be maintained for 30 seconds and sufficiently longer to insure complete expansion. Any internal pressure applied after heat-treatment and previous to the official test must not exceed 90 percent of the test pressure. If, due to failure of the test apparatus, the test pressure cannot be maintained, the test may be repeated at a pressure increased by 10 percent or 100 pounds per square inch, whichever is the lower.

(c) Permanent volumetric expansion must not exceed 10 percent of total volumetric expansion at test pressure.

(d) Each cylinder must be tested to at least 2 times service pressure.

§ 178.39-15 Flattening test.

(a) Between knife edges wedge shaped, 60° angle, rounded to $\frac{1}{2}$ " radius; test 1 cylinder¹ taken at random out of each lot of 200 or less, after hydrostatic test.

§ 178.39-16 Physical test.

(a) To determine yield strength, tensile strength, elongation, and reduction of area of material: Required on 2 specimens cut from 1¹ cylinder taken at random out of each lot of 200 or less.

(b) Specimens must be: Gauge length 8 inches with width not over $1\frac{1}{2}$ inches; or, gauge length 2 inches with width not over $1\frac{1}{2}$ inches: *Provided*, That gauge length at least 24 times thickness with width not over 6 times thickness is authorized when cylinder wall is not over $\frac{3}{16}$ inch thick. The specimen, exclusive of grip ends, must not be flattened. Grip ends may be flattened to within one inch of each end of the reduced section. When size of cylinder does not permit securing straight specimens, the specimens may be taken in any location or direction and may be straightened or flattened cold, by pressure only, not by blows; when specimens are so taken and prepared, the inspector's report must show in connection with record of physical tests detailed information in regard

¹ For lots of 30 or less physical and flattening test are authorized to be made on a ring at least 8 inches long cut from each cylinder and subjected to same heat treatment as the finished cylinder.

to such specimens. Heating of specimen for any purpose is not authorized.

(c) The yield strength in tension shall be the stress corresponding to a permanent strain of 0.2 percent of the gauge length.

(1) The yield strength shall be determined by either the "offset" method or the "extension under load" method as prescribed in ASTM Standard E8-57T.

(2) In using the "extension under load" method, the total strain (or "extension under load") corresponding to the stress at which the 0.2 percent permanent strain occurs may be determined with sufficient accuracy by calculating the elastic extension of the gauge length under appropriate load and adding thereto 0.2 percent of the gauge length. Elastic extension calculations shall be based on an elastic modulus of 30,000,000. In the event of controversy, the entire stress-strain diagram shall be plotted and the yield strength determined from the 0.2 percent offset.

(3) For the purpose of strain measurement, the initial strain shall be set while the specimen is under a stress of 12,000 pounds per square inch, the strain indicator reading being set at the calculated corresponding strain.

(4) Cross-head speed of the testing machine shall not exceed $\frac{1}{4}$ inch per minute during yield strength determination.

§ 178.39-17 Acceptable results for physical and flattening tests.

(a) Either of the following:

(1) Elongation at least 40 percent for 2" gauge length or at least 20 percent in other cases; yield point not over 50 percent of tensile strength; flattening test not required.

(2) Elongation at least 20 percent for 2" gauge length or 10 percent in other cases; yield point not over 50 percent of tensile strength; flattening required, without cracking, to 6 times wall thickness.

§ 178.39-18 Rejected cylinders.

(a) Reheat treatment authorized; subsequent thereto, acceptable cylinders must pass all prescribed tests. Repair by welding not authorized.

§ 178.39-19 Marking.

(a) Marking on each cylinder by stamping plainly and permanently on shoulder, top head, or neck as follows:

(1) DOT-3BN followed by service pressure (for example DOT-3BN400, etc.).

(2) A serial¹ number and an identifying symbol (letters); location² of number to be just below or immediately following the DOT mark; location² of symbol to be just below or immediately following the number. The symbol and numbers must be those of person making DOT mark. The symbol must be registered with the Bureau of Explosives; duplications unauthorized.

Examples:

DOT-3BN400

1234

XY

DOT-3BN400-1234-XY

(3) Inspector's official mark, near serial number; date of test (such as 5-50 for May 1950), so placed that dates of subsequent tests can be easily added.

§ 178.39-20 Size of marks.

(a) At least 1/4" high if space permits.

§ 178.39-21 Inspector's report.

(a) Required to be clear, legible, and in following form:

(Place)

(Date)

Gas cylinders

Manufactured for..... Company
Location at.....
Manufactured by..... Company
Location at.....
Consigned to..... Company
Location at.....
Quantity

¹ Lot numbers, not over 500 cylinders in each lot, authorized for cylinders not over 2 inches outside diameter.

² Symbol in front of or following the number with ample space between is also authorized. Other variation in location authorized only when necessitated by lack of space.

Gas cylinders

Size inches outside diameter by
..... inches long.

Marks stamped into the shoulder of the cylinder are:

Specification DOT-.....

Serial numbers..... to inclusive.

Inspector's mark.....

Identifying symbol (registered).....

Test date.....

Tare weights (yes or no).....

Other marks (if any).....

These cylinders were made by process of.....

The permitted in

(neckrings—footrings)

§ 178.39-9 were attached by process of

(welding-brazing)

The material used was identified by the following numbers

(heat-purchase order)

The material used was verified as to chemical analysis and record thereof is attached hereto. The heat numbers

(were—were not)

marked on the material.

All material, such as plates, billets and seamless tubing, was inspected and each cylinder was inspected both before and after closing in the ends; all that was accepted was found free from seams, cracks, laminations, and other defects which might prove injurious to the strength of the cylinder. The processes of manufacture and heat treatment of cylinders were supervised and found to be efficient and satisfactory.

The cylinder walls were measured and the minimum thickness noted was inch. The outside diameter was determined by a close approximation to be inches. The wall stress was calculated to be pounds per square inch under an internal pressure of pounds per square inch.

Hydrostatic tests, flattening tests, tensile tests of material, and other tests, as prescribed in specification No. DOT-3BN were made in the presence of the inspector and all material and cylinders accepted were found to be in compliance with the requirements of that specification. Records thereof are attached hereto.

I hereby certify that all of these cylinders proved satisfactory in every way and comply with the requirements of Department of Transportation specification No. 3BN except as follows:

Exceptions

(Signed)

Inspector

(Place)
(Date)

RECORD OF CHEMICAL ANALYSIS OF MATERIAL FOR CYLINDERS

Numbered to inclusive.
Size inches outside diameter by inches long
Made by Company
For Company

NOTE: Any omission of analyses by heats, if authorized, must be accounted for by notation hereon reading "The prescribed certificate of the manufacturer of material has been secured, found satisfactory, and placed on file," or by attaching a copy of the certificate.

Test No.	Heat No.	Check analysis No.	Cylinders represented (Serial Nos.)	Chemical analysis						
				C	P	S	Si	Mn	Ni	Cr

The analyses were made by
(Signed)

(Place)
(Date)

RECORD OF PHYSICAL TESTS OF MATERIAL FOR CYLINDERS

Numbered to inclusive.
Size inches outside diameter by inches long
Made by Company
For Company

Test No.	Cylinders represented by test (Serial Nos.)	Yield strength (pounds per square inch)	Tensile strength (pounds per square inch)	Elongation (percent in 8 inches)	Reduction of area (percent)	Flattening test

(Signed)

(Place)
(Date)

RECORD OF HYDROSTATIC TESTS ON CYLINDERS

Numbered to inclusive.
Size inches outside diameter by inches long
Made by Company
For Company

Serial Nos. of cylinders tested arranged numerically	Actual test pressure (pounds per square inch)	Total expansion (cubic centimeters) ¹	Permanent expansion (cubic centimeters) ¹	Percent ratio of permanent expansion to total expansion ¹	Tare weight (pounds) ²	Volumetric capacity ²

¹ If the tests are made by a method involving the measurement of the amount of liquid forced into the cylinder by the test pressure, then the basic data, on which the calculations are made, such as the pump factors, temperature of liquid, coefficient of compressibility of liquid, etc., must also be given.

² Do not include removable cap but state whether with or without value. These weights must be accurate to a tolerance of 1 percent.

(Signed)

§ 178.40 Specification 3C; seamless steel cylinders.

§ 178.40-1 Compliance.

(a) Required in all details.

§ 178.40-2 Type, size, and service pressure.

(a) *Type and size.* Seamless; not over 1,000 pounds water capacity (nominal).

(b) *Service pressure.*¹ At least 90 to not over 300 pounds per square inch.

§ 178.40-3 Inspection by whom and where.

Inspections and verifications must be performed by an independent inspection agency or, in the case of cylinders manufactured in the United States, a competent inspector of the manufacturer. Chemical analyses and tests as specified must be made within the United States.

§ 178.40-4 Duties of inspector.

(a) Inspect all material and reject any not complying with requirements; for cylinders made by billet-piercing process, billets to be inspected after nick and cold break.

(b) Verify chemical analysis of each heat of material by analysis or by obtaining certified analysis: *Provided*, That a certificate from the manufacturer thereof, giving sufficient data to indicate compliance with requirements, is acceptable when verified by check analyses of samples taken from one cylinder out of each lot of 200 or less.

(c) Verify compliance of cylinders with all requirements including markings; inspect inside before closing in both ends; verify heat treatment as proper; obtain samples for all tests and check chemical analyses; witness all tests; verify threads by gauge; report volumetric capacity and tare weight (see report form) and minimum thickness of wall noted.

¹ The "service pressure" limits the use of the cylinder. It is shown by marks on cylinder; for example, DOT-3C300 indicates the service pressure as 300 pounds per square inch.

(d) Render complete report (§ 178.40-22) to purchaser and cylinder maker.

§ 178.40-5 Steel.

(a) Open-hearth or electric steel of uniform quality. Content percent for the following not over: Carbon, 0.55; phosphorus, 0.045; sulphur, 0.050.

§ 178.40-6 Identification of material.

(a) Required; any suitable method except that plates and billets for hot-drawn cylinders shall be marked with heat number.

§ 178.40-7 Defects.

(a) Material with seams, cracks, laminations, or other injurious defects, not authorized.

§ 178.40-8 Manufacture.

(a) By best appliances and methods; dirt and scale to be removed as necessary to afford proper inspection; no fissure or other defect acceptable that is likely to weaken the finished cylinder appreciably; reasonably smooth and uniform surface finish required. If not originally free from such defects, the surface may be machined or otherwise treated to eliminate these defects. The thickness of the bottoms of cylinders welded or formed by spinning is, under no condition, to be less than two times the minimum wall thickness of the cylindrical shell; such bottom thickness to be measured within an area bounded by a line representing the points of contact between the cylinder and floor when the cylinder is in a vertical position.

§ 178.40-9 Welding or brazing.

(a) Welding or brazing for any purpose whatsoever is prohibited except as follows:

(1) Welding or brazing is authorized for the attachment of neckrings and footrings which are non-pressure parts, and only to the tops and bottoms of cylinders having a service pressure of 500 pounds per square inch or less. Cylinders, neckrings, and footrings must be made of weldable steel, carbon content of which must not exceed 0.25 percent except in the case of 4130X steel which may be used with proper welding procedure.

(2) As permitted in § 178.40-8.

§ 178.40-10 Wall thickness.

(a) The wall stress shall not exceed 24,000 pounds per square inch. Minimum wall 0.090" for any cylinder over 5" outside diameter.

(b) Calculation must be made by the formula:

$$S = \frac{P(1.3D^2 + 0.4d^2)}{D^2 - d^2}$$

where

S=wall stress in pounds per square inch;

P=minimum test pressure prescribed for water jacket test or 450 pounds per square inch whichever is the greater;

D=outside diameter in inches;

d=inside diameter in inches.

§ 178.40-11 Heat treatment.

(a) The completed cylinders must be uniformly and properly heat-treated prior to tests.

§ 178.40-12 Openings in cylinders and connections (valves, fuse plugs, etc.) for those openings.

(a) Threads required, to be clean cut, even, without checks, and to gauge.

(b) Taper threads, when used, to be of length not less than as specified for American Standard taper pipe threads.

(c) Straight threads having at least 6 engaged threads are authorized; to have tight fit and calculated shear strength at least 10 times the test pressure of the cylinder; gaskets required, adequate to prevent leakage.

§ 178.40-13 Safety devices and protection for valves, safety devices, and other connections, if applied.

(a) Must be as required by the Department's regulations that apply (see §§ 173.34(d) and 173.301(g) of this chapter).

§ 178.40-14 Hydrostatic test.

(a) By water-jacket, or other suitable method, operated so as to obtain accurate data. Pressure gauge must permit reading to accuracy of 1 percent. Expansion gauge must permit reading of total expansion to accuracy either of 1 percent or 0.1 cubic centimeter.

(b) Pressure must be maintained for 30 seconds and sufficiently longer to insure complete expansion. Any internal

pressure applied after heat-treatment and previous to the official test must not exceed 90 percent of the test pressure. If, due to failure of the test apparatus, the test pressure cannot be maintained, the test may be repeated at a pressure increased by 10 percent or 100 pounds per square inch, whichever is the lower.

(c) Permanent volumetric expansion must not exceed 10 percent of total volumetric expansion at test pressure.

(d) Cylinders must be tested as follows: 1 cylinder out of each lot of 200 or less; to at least 3 times service pressure. Others must be examined under pressure of 2 times service pressure and show no defect. If tested cylinder fails, each cylinder in the lot may be tested: those passing are acceptable.

§ 178.40-15 Flattening test.

(a) Between knife edges, wedge shaped; 60° angle, rounded to 1/2" radius; test 1 cylinder¹ taken at random out of each lot of 200 or less, after hydrostatic test.

§ 178.40-16 Physical test.

(a) To determine yield strength, tensile strength, elongation, and reduction of area of material. Required on 2 specimens cut from 1¹ cylinder taken at random out of each lot of 200 or less.

(b) Specimens must be gauge length 8 inches with width not over 1 1/2 inches; or, gauge length 2 inches with width not over 1 1/2 inches; *Provided*, That gauge length at least 24 times thickness with width not over 6 times thickness is authorized when cylinder wall is not over 3/16 inch thick. The specimen, exclusive of grip ends, must not be flattened. Grip ends may be flattened to within one inch of each end of the reduced section. When size of cylinder does not permit securing straight specimens, the specimens may be taken in any location or direction and may be straightened or flattened cold, by pressure only, not by blows; when specimens are so taken and prepared, the inspector's report must show in connection with record of physical tests de-

¹ For lots of 30 or less physical and flattening tests are authorized to be made on a ring at least 8 inches long cut from each cylinder and subjected to same heat treatment as the finished cylinder.

tailed information in regard to such specimens. Heating of specimen for any purpose is not authorized.

(c) The yield strength in tension shall be the stress corresponding to a permanent strain of 0.2 percent of the gauge length.

(1) The yield strength shall be determined by either the "offset" method or the "extension under load" method as prescribed in ASTM Standard E8-57T.

(2) In using the "extension under load" method, the total strain (or "extension under load") corresponding to the stress at which the 0.2 percent permanent strain occurs may be determined with sufficient accuracy by calculating the elastic extension of the gauge length under appropriate load and adding thereto 0.2 percent of the gauge length. Elastic extension calculations shall be based on an elastic modulus of 30,000,000. In the event of controversy, the entire stress-strain diagram shall be plotted and the yield strength determined from the 0.2 percent offset.

(3) For the purpose of strain measurement, the initial strain shall be set while the specimen is under a stress of 12,000 pounds per square inch, the strain indicator reading being set at the calculated corresponding strain.

(4) Cross-head speed of the testing machine shall not exceed $\frac{1}{8}$ inch per minute during yield strength determination.

§ 178.40-17 Acceptable results for physical and flattening tests.

(a) Either of the following:

(1) Elongation at least 40 percent for 2 inch gauge length or at least 20 percent in other cases; yield strength not over 73 percent of tensile strength; flattening test not required.

(2) Elongation at least 20 percent for 2 inch gauge length or 10 percent in other cases; yield strength not over 73 percent of tensile strength; flattening required, without cracking, to 6 times wall thickness.

§ 178.40-18 Leakage test.

(a) All spun cylinders and plugged cylinders (see Notes 1 and 2) must be tested for leakage by gas or air pressure after the bottom has been cleaned and is free from all moisture. Pressure, approxi-

mately the same as but no less than service pressure, must be applied to one side of the finished bottom over an area of at least $\frac{1}{16}$ of the total area of the bottom but not less than $\frac{3}{4}$ inch in diameter, including the closure, for at least one minute, during which time the other side of the bottom exposed to pressure must be covered with water and closely examined for indications of leakage. Leakers must be rejected. (See Note 1, § 178.40-19.)

NOTE 1: A spun cylinder is one in which an end closure in the finished cylinder has been welded by the spinning process.

NOTE 2: A plugged cylinder is one in which a permanent closure in the bottom of a finished cylinder has been effected by a plug.

NOTE 3: As a safety precaution, if the manufacturer elects to make this test before the hydrostatic test, he should design his apparatus so that the pressure is applied to the smallest area practicable, around the point of closure, and so as to use the smallest possible volume of air or gas.

§ 178.40-19 Rejected cylinders.

(a) Reheat treatment authorized; subsequent thereto, acceptable cylinders must pass all prescribed tests. Repair by welding or spinning is not authorized.

NOTE 1: Spun cylinders rejected under the provisions of § 178.40-18 may be removed from the spun cylinder category by drilling to remove defective material, tapping and plugging.

§ 178.40-20 Marking.

(a) Marking on each cylinder by stamping plainly and permanently on shoulder, top head, or neck as follows:

(1) DOT-3C followed by the service pressure (for example DOT-3C300, etc.).

(2) A serial¹ number and an identifying symbol (letters); location² of number to be just below or immediately following the DOT mark; location² of symbol to be just below or immediately following the number. The symbol and

¹ Lot numbers, not over 500 cylinders in each lot, authorized for cylinders not over 2 inches outside diameter and for cylinders over 2 inches outside diameter when the volumetric capacity does not exceed 60 cubic inches.

² Symbol in front of or following the number with ample space between is also authorized. Other variation in location authorized only when necessitated by lack of space.

numbers must be those of person making DOT mark. The symbol must be registered with the Bureau of Explosives; duplications unauthorized.

Examples:

DOT-3C300
1234
XY
DOT-3C300-1234-XY

(3) Inspector's official mark near serial number; date of test (such as 5-50 for May 1950), so placed that dates of subsequent tests can be easily added; and word "SPUN" or "PLUG" near DOT mark when an end closure in the finished cylinder has been welded by the spinning process, or effected by plugging.

§ 178.40-21 Size of marks.

(a) At least 1/4" high if space permits.

§ 178.40-22 Inspector's report.

(a) Required to be clear, legible, and in following form:

(Place) _____
(Date) _____
Gas cylinders
Manufactured for _____ Company
Location at _____
Manufactured by _____ Company
Location at _____
Consigned to _____ Company
Location at _____

Quantity _____
Size _____ inches outside diameter by _____
The material used was verified as to chemical analysis and record thereof is attached hereto. The heat numbers _____ (were—were not)

marked on the material.

All material, such as plates, billets and seamless tubing, was inspected and each cylinder was inspected both before and after closing in the ends; all that was accepted was found free from seams, cracks, laminations, and other defects which might prove injurious to the strength of the cylinder. The processes of manufacture and heat treatment of cylinders were supervised and found to be efficient and satisfactory.

The cylinder walls were measured and the minimum thickness noted was _____ inch. The outside diameter was determined by a close approximation to be _____ inches. The wall stress was calculated to be _____ pounds per square inch under an internal pressure of _____ pounds per square inch.

Hydrostatic tests, flattening tests, tensile tests of material, and other tests, as prescribed in specification No. DOT-3C were made in the presence of the inspector and all material and cylinders accepted were found to be in compliance with the requirements of that specification. Records thereon are attached hereto.

I hereby certify that all of these cylinders proved satisfactory in every way and comply with the requirements of Department of Transportation specification No. 3C except as follows:

Exceptions: _____

(Signed) _____

Inspector.

(Place) _____
(Date) _____

RECORD OF CHEMICAL ANALYSIS OF MATERIAL FOR CYLINDERS

Numbered _____ to _____ inclusive.
Size _____ inches outside diameter by _____ inches long
Made by _____ Company
For _____ Company

NOTE. Any omission of analyses by heats, if authorized, must be accounted for by notation hereon reading "The prescribed certificate of the manufacturer of material has been secured, found satisfactory, and placed on file," or by attaching a copy of the certificate.

Test No.	Heat No.	Check analysis No.	Cylinders represented (serial Nos.)	Chemical analysis						
				C	P	S	Si	Mn	Ni	Cr

The analyses were made by _____
(Signed) _____

(Place) _____
(Date) _____

RECORD OF PHYSICAL TESTS OF MATERIAL FOR CYLINDERS

Numbered to inclusive.
Size inches outside diameter by inches long
Made by Company
For Company

Test No.	Cylinders represented by test (Serial Nos.)	Yield strength (pounds per square inch)	Tensile strength (pounds per square inch)	Elongation (percent in 8 inches)	Reduction of area (percent)	Flattening test

(Signed) _____

(Place) _____
(Date) _____

RECORD OF HYDROSTATIC TESTS ON CYLINDERS

Numbered to inclusive.
Size inches outside diameter by inches long
Made by Company
For Company

Serial Nos. of cylinders tested arranged numerically	Actual test pressure (pounds per square inch)	Total expansion (cubic centimeters) ¹	Permanent expansion (cubic centimeters) ¹	Percent ratio of permanent expansion to total expansion ¹	Tare weight (pounds) ²	Volumetric capacity ³

NOTE: When specifications require test for only 1 out of each lot of 200 or less cylinders, the check on the others must be indicated by a notation hereon reading: "Each cylinder was subjected to a pressure of pounds per square inch and showed no defect."

¹ If the tests are made by a method involving the measurement of the amount of liquid forced into the cylinder by the test pressure, then the basic data, on which the calculations are made, such as the pump factors, temperature of liquid, coefficient of compressibility of liquid, etc., must also be given.

² Do not include removable cap but state whether with or without valve. These weights must be accurate to a tolerance of 1 percent.

³ Report approximate maximum and minimum volumetric capacity for the lot.

(Signed) _____

§ 178.41 Specification 3D; seamless steel cylinders.

§ 178.41-3 Inspection by whom and where.

§ 178.41-1 Compliance.

(a) Required in all details.

§ 178.41-2 Type, size, and service pressure.

(a) *Type and size.* Seamless; not over 125 pounds water capacity (nominal); closing of bottom ends by spinning or swedging not authorized.

(b) *Service pressure.*¹ Must be 480 pounds per square inch.

Inspections and verifications must be performed by an independent inspection agency. Chemical analyses and tests as specified must be made within the United States.

¹ The "service pressure" limits the use of the cylinder. It is shown by marks on cylinder; for example, DOT-3D480 indicates the service pressure as 480 pounds per square inch.

§ 178.41-4 Duties of inspector.

(a) Inspect all material and reject any not complying with requirements, for

cylinders made by billet-piercing process, billets to be inspected after nick and cold break.

(b) Verify chemical analysis of each heat of material by analysis or by obtaining certified analysis: *Provided*, That a certificate from the manufacturer thereof, giving sufficient data to indicate compliance with requirements, is acceptable when verified by check analyses of samples taken from one cylinder out of each lot of 200 or less.

(c) Verify compliance of cylinders with all requirements including markings; inspect inside before closing in both ends; verify heat treatment as proper; obtain samples for all tests and check chemical analyses; witness all tests; verify threads by gauge; report volumetric capacity and tare weight (see report form) and minimum thickness of wall noted. Inspection of valves and protection caps is required.

(d) Render complete report (§ 178.41-21) to purchaser and cylinder maker.

§ 178.41-5 Steel.

(a) Open-hearth or electric steel of uniform quality. Content percent for the following not over: Carbon, 0.55; phosphorus, 0.045; sulphur, 0.050.

§ 178.41-6 Identification of material.

(a) Required; any suitable method except that plates and billets for hot-drawn cylinders shall be marked with heat number.

§ 178.41-7 Defects.

(a) Material with seams, cracks, laminations, or other injurious defects, not authorized.

§ 178.41-8 Manufacture.

(a) By best appliances and methods; dirt and scale to be removed as necessary to afford proper inspection; no defect acceptable that is likely to weaken the finished cylinder appreciably; reasonably smooth and uniform surface finish required.

(b) Extension ring: Top end of cylinder over 5" outside diameter must be fitted with section of tubing shrunk on, not welded to cylinder, and extending at least 4" below shoulder and above neck; thickness of ring as prescribed for cylinder wall; drain holes required.

(c) Valve and protection cap of metal substantially noncorrodible.

(d) Valve body and other parts subject to gas pressure when closed to be of forged, drawn, or extruded metal. Plug instead of valve is authorized.

(e) Protection cap must be at least $\frac{3}{16}$ " thick, gas tight, with $\frac{3}{16}$ " faced seat for gasket, and with United States standard form thread; it must not project beyond extension ring.

(f) Assembly of valves to cylinder: Selective method required so that at least 1 thread is left disengaged when screwed home. Efficient luting material required. Assembly by shippers is permitted without supervision by inspector.

§ 178.41-9 Welding or brazing.

(a) Welding or brazing is authorized, but only for the sealing of neckrings which must be threaded on the external neck of cylinders of not over 500 cubic inches capacity. Cylinders and neckrings must be weldable steel, the carbon content of which must not exceed 0.25 percent except that the use of 4130X steel is authorized. The weld free from moisture must be tested with gas or air at not less than 800 pounds per square inch.

§ 178.41-10 Wall thickness.

(a) The wall stress shall not exceed 16,000 pounds per square inch. Minimum wall 0.100" for any cylinder over 5" outside diameter.

(b) Calculation must be made by the formula:

$$S = \frac{P(1.3D^2 + 0.4d^2)}{D^2 - d^2}$$

where

S = wall stress in pounds per square inch;

P = 800 pounds per square inch;

D = outside diameter in inches;

d = inside diameter in inches.

§ 178.41-11 Heat treatment.

(a) The completed cylinders must be uniformly and properly heat-treated prior to tests.

§ 178.41-12 Openings in cylinders and connections (valves, fuse plugs, etc.) for those openings.

(a) Threads required to be clean cut, even, without checks, and to gauge.

(b) Taper threads, when used, to be of length not less than as specified for American Standard taper pipe threads.

§ 178.41-13 Safety devices and protection for valves, safety devices, and other connections, if applied.

(a) Must be as required by the Department's regulations that apply (see §§ 173.34(d), 173.301(g) and 173.124(a) of this chapter).

§ 178.41-14 Hydrostatic test.

(a) By water-jacket, or other suitable method, operated so as to obtain accurate data. Pressure gauge must permit reading to accuracy of 1 percent. Expansion gauge must permit reading of total expansion to accuracy either of 1 percent or 0.1 cubic centimeter.

(b) Pressure must be maintained for 30 seconds and sufficiently longer to insure complete expansion. Any internal pressure applied after heat-treatment and previous to the official test must not exceed 90 percent of the test pressure. If, due to failure of the test apparatus, the test pressure cannot be maintained, the test may be repeated at a pressure increased by 10 percent or 100 pounds per square inch, whichever is the lower.

(c) Permanent volumetric expansion must not exceed 10 percent of total volumetric expansion at test pressure.

(d) Each cylinder must be tested to at least $5/3$ times service pressure.

§ 178.41-15 Flattening test.

(a) Between knife edges, wedge shaped, 60° angle, rounded to $1/2''$ radius; test 1 cylinder¹ taken at random out of each lot of 200 or less, after hydrostatic test.

§ 178.41-16 Physical test.

(a) To determine yield strength, tensile strength, elongation, and reduction of area of material. Required on 2 specimens cut from 1¹ cylinder taken at random out of each lot of 200 or less.

(b) Specimens must be: Gauge length 8 inches with width not over $1\frac{1}{2}$ inches; or, gauge length 2 inches with width not over $1\frac{1}{2}$ inches; provided, that gauge length at least 24 times thickness with width not over 6 times thickness is au-

thorized when cylinder wall is not over $3/16$ inch thick. The specimen, exclusive of grip ends, must not be flattened. Grip ends may be flattened to within one inch of each end of the reduced section. When size of cylinder does not permit securing straight specimens, the specimens may be taken in any location or direction and may be straightened or flattened cold, by pressure only, not by blows; when specimens are so taken and prepared, the inspector's report must show in connection with record of physical tests detailed information in regard to such specimens. Heating of specimen for any purpose is not authorized.

(c) The yield strength in tension shall be the stress corresponding to a permanent strain of 0.2 percent of the gauge length.

(1) The yield strength shall be determined by either the "offset" method or the "extension under load" method as prescribed in ASTM Standard E8-57T.

(2) In using the "extension under load" method, the total strain (or "extension under load") corresponding to the stress at which the 0.2 percent permanent strain occurs may be determined with sufficient accuracy by calculating the elastic extension of the gauge length under appropriate load and adding thereto 0.2 percent of the gauge length. Elastic extension calculations shall be based on an elastic modulus of 30,000,000. In the event of controversy, the entire stress-strain diagram shall be plotted and the yield strength determined from the 0.2 percent offset.

(3) For the purpose of strain measurement, the initial strain shall be set while the specimen is under a stress of 12,000 pounds per square inch, the strain indicator reading being set at the calculated corresponding strain.

(4) Cross-head speed of the testing machine shall not exceed $1/8$ inch per minute during yield strength determination.

§ 178.41-17 Acceptable results for physical and flattening tests.

(a) Either of the following:

(1) Elongation at least 40 percent for 2 inch gauge length or at least 20 percent in other cases; yield strength not over 73 percent of tensile strength; flattening test not required.

(2) Elongation at least 20 percent for 2 inch gauge length or 10 percent in

¹ For lots of 30 or less, physical and flattening tests are authorized to be made on a ring at least 8 inches long cut from each cylinder and subjected to same heat treatment as the finished cylinder.

other cases; yield strength not over 73 percent of tensile strength; flattening test is required, without cracking, to 4 times wall thickness.

§ 178.41-18 Rejected cylinders.

(a) Reheat treatment authorized; subsequent thereto, acceptable cylinders must pass all prescribed tests. Repair by welding is not authorized.

§ 178.41-19 Marking.

(a) Marking on each cylinder by stamping plainly and permanently on shoulder, top head, or neck, and also on extension ring, as follows:

(1) DOT-3D480.

(2) A serial¹ number and an identifying symbol (letters); location² of number to be just below or immediately following the DOT mark; location² of symbol to be just below or immediately following the number. The symbol and number must be those of person making DOT mark. The symbol must be registered with the Bureau of Explosives; duplications unauthorized.

Examples:

DOT-3D460
1234
XY
DOT-3D480-1234-XY

(3) Inspector's official mark near serial number; date of test (such as 5-50 for May 1950), so placed that dates of subsequent tests can be easily added.

§ 178.41-20 Size of marks.

(a) At least 1/4" high if space permits.

§ 178.41-21 Inspector's report.

(a) Required to be clear, legible, and in following form:

(Place) _____
(Date) _____

Gas cylinders

Manufactured for _____ Company
Location at _____
Manufactured by _____ Company

¹ Lot numbers, not over 500 cylinders in each lot, authorized for cylinders not over 2 inches outside diameter.

² Symbol in front of or following the number with ample space between is also authorized. Other variation in location authorized only when necessitated by lack of space.

Location at _____
Consigned to _____ Company
Location at _____
Quantity _____
Size _____ inches outside diameter by _____ inches long

Marks stamped into the shoulder of the cylinder are:

Specification DOT- _____
Serial numbers _____ to _____ inclusive.

Inspector's mark _____
Identifying symbol (registered) _____

Test date _____

Tare weights (yes or no) _____

Other marks (if any) _____

These cylinders were made by process of _____

_____ The neckrings _____ permitted in § 178.41-9 were attached by process of _____

(welding—brazing)

The material used was identified by the following _____

_____ numbers _____
(heat-purchase order)

The material used was verified as to chemical analysis and record thereof is attached hereto. The heat numbers _____

(were—were not)

marked on the material.

All material, such as plates, billets and seamless tubing, was inspected and each cylinder was inspected both before and after closing in the ends; all that was accepted was found free from seams, cracks, laminations, and other defects which might prove injurious to the strength of the cylinder. The processes of manufacture and heat treatment of cylinders were supervised and found to be efficient and satisfactory.

The cylinder walls were measured and the minimum thickness noted was _____ inch. The outside diameter was determined by a close approximation to be _____ inches. The wall stress was calculated to be _____ pounds per square inch under an internal pressure of _____ pounds per square inch.

Hydrostatic tests, flattening tests, tensile tests of material, and other tests, as prescribed in specification No. DOT-3D were made in the presence of the inspector and all material and cylinders accepted were found to be in compliance with the requirements of that specification. Records thereof are attached hereto.

I hereby certify that all of these cylinders proved satisfactory in every way and comply with the requirements of Department of Transportation Specification No. 3D except as follows:

Exceptions _____

(Signed) _____

Inspector.

(Place)
(Date)

RECORD OF CHEMICAL ANALYSIS OF MATERIAL FOR CYLINDERS

Numbered to inclusive.
Size inches outside diameter by inches long
Made by Company
For Company

NOTE: Any omission of analyses by heats, if authorized, must be accounted for by notation hereon reading "The prescribed certificate of the manufacturer of material has been secured, found satisfactory, and placed on file," or by attaching a copy of the certificate.

Test No.	Heat No.	Check analysis No.	Cylinders represented (serial Nos.)	Chemical analysis						
				C	P	S	Si	Mn	Ni	Cr

The analyses were made by

(Signed)

(Place)
(Date)

RECORD OF PHYSICAL TESTS OF MATERIAL FOR CYLINDERS

Numbered to inclusive.
Size inches outside diameter by inches long
Made by Company
For Company

Test No.	Cylinders represented by test (Serial Nos.)	Yield strength (pounds per square inch)	Tensile strength (pounds per square inch)	Elongation (percent in 8 inches)	Reduction of area (percent)	Flattening test
.....
.....
.....
.....

(Signed)

(Place)
(Date)

RECORD OF HYDROSTATIC TESTS ON CYLINDERS

Numbered to inclusive.
Size inches outside diameter by inches long
Made by Company
For Company

Serial Nos. of cylinders tested arranged numerically	Actual test pressure (pounds per square inch)	Total expansion (cubic centimeters) ¹	Permanent expansion (cubic centimeters) ¹	Percent ratio of permanent expansion to total expansion ¹	Tare weight (pounds) ²	Volumetric capacity
.....
.....
.....
.....

¹ If the tests are made by a method involving the measurement of the amount of liquid forced into the cylinder by the test pressure, then the basic data, on which the calculations are made, such as the pump factors, temperature of liquid, coefficient of compressibility of liquid, etc., must also be given.

² Do not include removable cap but state whether with or without valve. These weights must be accurate to a tolerance of 1 percent.

(Signed)

§ 178.42 Specification 3E; seamless steel cylinders.

§ 178.42-1 Compliance.

(a) Required in all details.

§ 178.42-2 Type, size, and service pressure.

(a) *Type and size.* Seamless. Must have outside diameter not greater than 2 inches nominal, length less than 2 feet.

(b) *Service pressure.*¹ Must be 1,800 pounds per square inch.

§ 178.42-3 Inspection by whom and where.

Inspections and verifications must be performed by an independent inspection agency or, in the case of cylinders manufactured in the United States, a competent inspector of the manufacturer. Chemical analyses and tests as specified must be made within the United States.

§ 178.42-4 Duties of inspector.

(a) Inspect all material and reject any not complying with requirements; for cylinders made by billet-piercing process, billets to be inspected after nick and cold break.

(b) Verify chemical analysis of each heat of steel by analysis or by obtaining certified analysis: *Provided*, That check analysis of samples taken from one cylinder out of each lot of 200 or less is acceptable.

(c) Verify compliance of cylinders with all requirements including markings; inspect inside before closing in both ends; verify heat treatment as proper; obtain samples for all tests and check chemical analyses; witness all tests; verify threads by gauge; report volumetric capacity and tare weight (see report form) and minimum thickness of wall noted.

(d) Render complete report (§ 178.42-15) to purchaser and cylinder maker.

¹ The "service pressure" limits the use of the cylinder. It is shown by marks on cylinder; for example, DOT-3E1800 indicates the service pressure as 1,800 pounds per square inch.

§ 178.42-5 Steel.

(a) Open-hearth or electric steel of uniform quality. Content percent for the following not over: Carbon, 0.55; phosphorus, 0.045; sulphur, 0.050.

§ 178.42-6 Identification of steel.

(a) Required; any suitable method.

§ 178.42-7 Defects.

(a) Material with seams, cracks, laminations, or other injurious defects, not authorized.

§ 178.42-8 Manufacture.

(a) By best appliances and methods; dirt and scale to be removed as necessary to afford proper inspection; no defect acceptable that is likely to weaken the finished cylinder appreciably; reasonably smooth and uniform surface finish required. The thickness of the spun bottom is, under no condition, to be less than two times the minimum wall thickness of the cylindrical shell; such bottom thickness to be measured within an area bounded by a line representing the points of contact between the cylinder and floor when the cylinder is in a vertical position.

§ 178.42-9 Openings in cylinders and connections (valves, fuse plugs, etc.) for those openings.

(a) Threads required, to be clean cut, even, without checks, and to gauge.

(b) Taper threads, when used, to be of length not less than as specified for American Standard taper pipe threads.

(c) Straight threads having at least 4 engaged threads are authorized; to have tight fit and calculated shear strength at least 10 times the test pressure of the cylinder; gaskets required, adequate to prevent leakage.

§ 178.42-10 Safety devices and protection for valves, safety devices, and other connections, if applied.

(a) Must be as required by the Department's regulations that apply (see §§ 173.34(d) and 173.301(g) of this chapter).

§ 178.42-11 Hydrostatic test.

(a) Cylinders must be tested as follows:

(1) One cylinder out of each lot of 500 or less to be subjected to hydrostatic

pressure of 6,000 pounds per square inch or higher.

(2) The cylinder referred to in subparagraph (1) of this paragraph shall burst at a pressure higher than 6,000 pounds per square inch without fragmenting or otherwise showing lack of ductility, or shall hold a pressure of 12,000 pounds per square inch for 30 seconds without bursting, in which case it shall be subjected to a flattening test without cracking to six times wall thickness between knife edges, wedge shaped 60 degree angle, rounded out to $\frac{1}{2}$ inch radius.

NOTE 1: Inspector's report shall be suitably changed to show results of latter alternate and flattening test.

(3) Other cylinders must be examined under pressure of at least 3,000 pounds per square inch and not to exceed 4,500 pounds per square inch and show no defect. Cylinders tested at a pressure in excess of 3,600 pounds per square inch shall burst at a pressure higher than 7,500 pounds per square inch when tested as specified in paragraph (a) (2) of this section. The pressure must be maintained for at least 30 seconds and sufficiently longer to insure complete examination.

§ 178.42-12 Leakage test.

(a) All spun cylinders and plugged cylinders (See Notes 1 and 2) must be tested for leakage by gas or air pressure after the bottom has been cleaned and is free from all moisture. Pressure, approximately the same as but no less than service pressure, must be applied to one side of the finished bottom over an area of at least $\frac{1}{16}$ of the total area of the bottom but not less than $\frac{3}{4}$ inch in diameter, including the closure, for at least one minute, during which time the other side of the bottom exposed to pressure must be covered with water and closely examined for indications of leakage. Leakers must be rejected. (See Note 1 to § 178.42-13.)

NOTE 1: A spun cylinder is one in which an end closure in the finished cylinder has been welded by the spinning process.

NOTE 2: A plugged cylinder is one in which a permanent closure in the bottom of a finished cylinder has been effected by a plug.

NOTE 3: As a safety precaution, if the manufacturer elects to make this test before the hydrostatic test, he should design his apparatus so that the pressure is applied to the

smallest area practicable, around the point of closure, and so as to use the smallest possible volume of air or gas.

§ 178.42-13 Rejected cylinders.

(a) Reheat treatment authorized; subsequent thereto, acceptable cylinders must pass all prescribed tests. Repair by welding or spinning is not authorized.

NOTE 1: Spun cylinders rejected under the provisions of § 178.42-12 may be removed from the spun cylinder category by drilling to remove defective material, tapping and plugging.

§ 178.42-14 Marking.

(a) Marking on each cylinder by stamping plainly and permanently as follows:

(1) DOT-3E1800.

(2) An identifying symbol (letters); location to be just following or below the DOT mark. The symbol and numbers must be those of person making DOT mark. The symbol must be registered with the Bureau of Explosives; duplications unauthorized.

Example:

DOT-3E1800
XY

(3) Date of test (such as 5-50 for May 1950).

§ 178.42-15 Inspector's report.

(a) Required to be clear, legible, and in following form:

(Place) -----
(Date) -----

Steel gas cylinders

Manufactured for ----- Company
Location at -----
Manufactured by ----- Company
Location at -----
Consigned to ----- Company
Location at -----
Quantity -----
Size ----- inches outside diameter by -----
inches long
Marks stamped into the shoulder of the cylinder are:
Specification DOT-3E1800
Serial numbers ----- to ----- inclusive (if numbered).
Identifying symbol (registered) -----
Test date -----
These cylinders were made by process of -----

The steel used was identified by the following ----- numbers -----
(heat-purchase order)

The steel used was verified as to chemical analysis and record thereof is attached hereto.

All material, such as plates, billets, and seamless tubing, was inspected and each cylinder was inspected both before and after closing in the ends; all that was accepted was found free from seams, cracks, laminations, and other defects which might prove injurious to the strength of the cylinder. The processes of manufacture and heat treatment were supervised and found to be efficient and satisfactory.

The cylinder walls were measured and the minimum thickness noted was ----- inch. The tare weight per cylinder without valve is ----- (approx.). The volumetric capacity per cylinder is ----- (approx.).

Each and every cylinder was properly tapped with a taper thread; the threads were inspected and found to be clean-cut, of proper length, and correct as to gauge.

One finished cylinder out of each lot of 500 or less was taken at random and burst by interior pressure with the following results:

Date of test	Pressure at which cylinder ruptured

Each and every cylinder with bottom closed in by spinning was subjected to an interior gas pressure of at least 1,800 pounds per square inch and showed no leakage.

Each and every cylinder was subjected to an interior pressure of at least 3,000 pounds per square inch and showed no defect.

I hereby certify that all of these cylinders proved satisfactory in every way and comply with the requirements of Department of Transportation specification No. 3E except as follows:

Exceptions -----

(Signed) -----

(Inspector)

(Place) -----

(Date) -----

RECORD OF CHEMICAL ANALYSIS OF Steel FOR CYLINDERS

Numbered ----- to ----- inclusive.
Size ----- inches outside diameter by ----- inches long
Made by ----- Company
For ----- Company

Test No.	Heat No.	Check analysis No.	Cylinders represented (Serial Nos.)	Chemical analysis						
				C	P	S	Si	Mn	Ni	Cr

The analyses were made by -----
(Signed) -----

(Place) -----

(Date) -----

RECORD OF PHYSICAL TESTS OF MATERIAL FOR CYLINDERS

Numbered ----- to ----- inclusive.
Size ----- inches outside diameter by ----- inches long
Made by ----- Company
For ----- Company

Test No.	Cylinders represented by test (Serial Nos.)	Yield strength (pounds per square inch)	Tensile strength (pounds per square inch)	Elongation (percent in 8 inches)	Reduction of area (percent)	Flattening test

(Signed) -----

(Place) _____
(Date) _____

RECORD OF HYDROSTATIC TESTS ON CYLINDERS

Numbered to inclusive.
Size inches outside diameter by inches long
Made by Company
For Company

[illegible]

NOTE: When specifications require test for only 1 out of each lot of 200 or less cylinders, the check on the others must be indicated by a notation hereon reading, "Each cylinder was subjected to a pressure of ----- pounds per square inch and showed no defect."

¹ If the tests are made by a method involving the measurement of the amount of liquid forced into the cylinder by the test pressure, then the basic data, on which the calculations are made, such as the pump factors, temperature of liquid, coefficient of compressibility of liquid, etc., must also be given.

³ Do not include removable can but state whether with or without valve. These weights must be accurate to a tolerance of 1 percent.

(Signed)

§ 178.43 Specification 3A480X; seam-
less steel cylinders.

§ 178.43-1 Compliance.

(a) Required in all details.

§ 178.43-2 Type, size, and service pressure.

(a) *Type and size.* Seamless, having not more than 278 pounds nominal water capacity.

(b) *Service pressure.*¹ 480 pounds per square inch.

§ 178.43-3 Inspection by whom and where.

Inspections and verifications must be performed by an independent inspection agency. Chemical analyses and tests as specified must be made within the United States.

cylinders made by billet-piercing process,
billets to be inspected after nick and cold
break.

(b) Verify chemical analysis of each heat of material by analysis or by obtaining certified analysis: *Provided*, That a certificate from the manufacturer thereof, giving sufficient data to indicate compliance with requirements, is acceptable when verified by check analyses of samples taken from one cylinder out of each lot of 200 or less.

(c) Verify compliance of cylinders with all requirements including markings; inspect inside before closing in both ends; verify heat treatment as proper; obtain samples for all tests and check chemical analyses; witness all tests; verify threads by gauge; report volumetric capacity and tare weight (see report form) and minimum thickness of wall noted.

(d) Render complete report (\$ 178.43-22) to purchaser and cylinder maker.

§ 178.43-5 Steel.

(a) Open-hearth or electric steel of uniform quality. Content percent for the following not over: carbon, 0.40; phosphorus, 0.045; sulphur, 0.050.

§ 178.43-6 Identification of material.

(a) Required; any suitable method except that plates and billets for hot-drawn cylinders shall be marked with heat number.

§ 178.43-4 Duties of inspector.

(a) Inspect all material and reject any not complying with requirements: for

¹ The "service pressure" limits the use of the cylinder. It is shown by marks on cylinder; for example, DOT-3A480X indicates the service pressure as 480 pounds per square inch.

§ 178.43-7 Defects.

(a) Material with seams, cracks, laminations, or other injurious defects, not authorized.

§ 178.43-8 Manufacture.

(a) By best appliances and methods; dirt and scale to be removed as necessary to afford proper inspection; no fissure or other defect acceptable that is likely to weaken the finished cylinder appreciably; reasonably smooth and uniform surface finish required. If not originally free from such defects, the surface may be machined or otherwise treated to eliminate these defects. The thickness of the bottoms of cylinders welded or formed by spinning is, under no condition, to be less than two times the minimum wall thickness of the cylindrical shell; such bottom thicknesses to be measured within an area bounded by a line representing the points of contact between the cylinder and floor when the cylinder is in a vertical position.

§ 178.43-9 Neckrings and footings.

(a) Welding for any purpose whatsoever is prohibited except as follows:

(1) Welding is authorized for the attachment of neckrings and footings which are nonpressure parts, and only to the tops and bottoms. Cylinders, neckrings, and footings must be made of weldable steel, carbon content of which must not exceed 0.25 percent.

(2) As permitted in § 178.43-8.

NOTE 1: Cylinders used solely in anhydrous ammonia service may have a $\frac{1}{2}$ inch diameter bar welded within their concave bottoms in accordance with the foregoing requirements.

§ 178.43-10 Wall thickness.

(a) Minimum wall 0.100" for any cylinder over 5" outside diameter. Wall stress shall not exceed 40,000 pounds per square inch.

(b) Calculation must be made by the formula:

$$S = \frac{P(1.3D^2 + 0.4d^2)}{D^2 - d^2}$$

where

S=wall stress in pounds per square inch;
P=800 pounds per square inch;
D=Outside diameter in inches;
d=inside diameter in inches.

§ 178.43-11 Heat treatment.

(a) The completed cylinders must be uniformly and properly heat-treated prior to tests.

§ 178.43-12 Openings in cylinders and connections (valves, fuse plugs, etc.) for those openings.

(a) Threads required to be clean cut even, without checks, and to gauge.

(b) Taper threads, when used, to be of length not less than as specified for American Standard taper pipe threads.

(c) Straight threads having at least 6 engaged threads are authorized; to have tight fit and calculated shear strength at least 10 times the test pressure of the cylinder; gaskets required, adequate to prevent leakage.

§ 178.43-13 Safety devices and protection for valves, safety devices, and other connections, if applied.

(a) Must be as required by the Department's regulations that apply (see §§ 173.34(d) and 173.301(g) of this chapter).

§ 178.43-14 Hydrostatic test.

(a) By water-jacket, or other suitable method, operated so as to obtain accurate data. Pressure gauge must permit reading to accuracy of 1 percent. Expansion gauge must permit reading of total expansion to accuracy either of 1 percent or 0.1 cubic centimeter.

(b) Pressure must be maintained for 30 seconds and sufficiently longer to insure complete expansion. Any internal pressure applied after heat-treatment and previous to the official test must not exceed 90 percent of the test pressure. If, due to failure of the test apparatus, the test pressure cannot be maintained, the test may be repeated at a pressure increased by 10 percent or 100 pounds per square inch, whichever is the lower.

(c) Permanent volumetric expansion must not exceed 10 percent of total volumetric expansion at test pressure.

(d) Each cylinder must be tested to at least $\frac{5}{3}$ times service pressure.

§ 178.43-15 Flattening test.

(a) Between knife edges, wedge shaped, 60° angle, rounded to $\frac{1}{2}$ " ra-

diameter; test 1 cylinder¹ taken at random out of each lot of 200 or less, after hydrostatic test.

§ 178.43-16 Physical test.

(a) To determine yield strength, tensile strength, elongation, and reduction of area of material. Required on 2 specimens cut from 1" cylinder taken at random out of each lot of 200 or less.

(b) Specimens must be: Gauge length 8 inches with width not over 1½ inches; or, gauge length 2 inches with width not over 1½ inches. *Provided*, That gauge length at least 24 times thickness with width not over 6 times thickness is authorized when cylinder wall is not over ⅜ inch thick. The specimen, exclusive of grip ends, must not be flattened. Grip ends may be flattened to within one inch of each end of the reduced section. When size of cylinder does not permit securing straight specimens, the specimens may be taken in any location or direction and may be straightened or flattened cold, by pressure only, not by blows; when specimens are so taken and prepared, the inspector's report must show in connection with record of physical tests detailed information in regard to such specimens. Heating of specimen for any purpose is not authorized.

(c) The yield strength in tension shall be the stress corresponding to a permanent strain of 0.2 percent of the gauge length.

(1) The yield strength shall be determined by either the "offset" method or the "extension under load" method as prescribed in ASTM Standard E8-57T.

(2) In using the "extension under load" method, the total strain (or "extension under load") corresponding to the stress at which the 0.2 percent permanent strain occurs may be determined with sufficient accuracy by calculating the elastic extension of the gauge length under appropriate load and adding thereto 0.2 percent of the gauge length. Elastic extension calculations shall be based on an elastic modulus of 30,000,000. In the event of controversy, the entire stress-strain diagram shall be plotted

and the yield strength determined from the 0.2 percent offset.

(3) For the purpose of strain measurement, the initial strain shall be set while the specimen is under a stress of 12,000 pounds per square inch, the strain indicator reading being set at the calculated corresponding strain.

(4) Cross-head speed of the testing machine shall not exceed ⅛ inch per minute during yield strength determination.

§ 178.43-17 Acceptable results for physical and flattening tests.

(a) Either of the following:

(1) Elongation at least 40 percent for 2 inch gauge length or at least 20 percent in other cases; yield strength not over 73 percent of tensile strength; flattening test not required.

(2) Elongation at least 20 percent for 2 inch gauge length or 10 percent in other cases; yield strength not over 73 percent of tensile strength; flattening required, without cracking, to 6 times wall thickness.

§ 178.43-18 Leakage test.

(a) All spun cylinders and plugged cylinders (see Notes 1 and 2) must be tested for leakage by gas or air pressure after the bottom has been cleaned and is free from all moisture. Pressure, approximately the same as but no less than service pressure, must be applied to one side of the finished bottom over an area of at least ⅙ of the total area of the bottom but not less than ¾ inch in diameter, including the closure, for at least one minute, during which time the other side of the bottom exposed to pressure must be covered with water and closely examined for indications of leakage. Leakers must be rejected. (See Note 1 to § 178.43-19).

NOTE 1: A spun cylinder is one in which an end closure in the finished cylinder has been made welded by the spinning process.

NOTE 2: A plugged cylinder is one in which a permanent closure in the bottom of a finished cylinder has been effected by a plug.

NOTE 3: As a safety precaution, if the manufacturer elects to make this test before the hydrostatic test, he should design his apparatus so that the pressure is applied to the smallest area practicable, around the point of closure, and so as to use the smallest possible volume of air or gas.

¹ For lots of 30 or less, physical and flattening tests are authorized to be made on a ring at least 8 inches long cut from each cylinder and subjected to same heat treatment as the finished cylinder.

§ 178.43-19 Rejected cylinders.

(a) Reheat treatment authorized; subsequent thereto, acceptable cylinders must pass all prescribed tests. Repair by welding or spinning is not authorized.

NOTE 1: Spun cylinders rejected under the provisions of § 178.43-18 may be removed from the spun cylinder category by drilling to remove defective material, tapping and plugging.

§ 178.43-20 Marking.

(a) Marking on each cylinder by stamping plainly and permanently on shoulder, top head, or neck as follows:

(1) DOT-3A480X.

(2) A serial number and an identifying symbol (letters); location¹ of number to be just below or immediately following the DOT mark; location¹ of symbol to be just below or immediately following the number. The symbol and numbers must be those of person making DOT mark. The symbol must be registered with the Bureau of Explosives; duplication unauthorized.

Examples:

DOT-3A480X

1234

XY

DOT-3A480X-1234-XY

(3) Inspector's official mark near serial number; date of test (such as 5-50 for May 1950), so placed that dates of subsequent tests can be easily added; and word "SPUN" or "PLUG" near DOT mark when an end closure in the finished cylinder has been welded by the spinning process, or effected by plugging.

§ 178.43-21 Size of marks.

(a) At least $\frac{1}{4}$ inch high if space permits.

§ 178.43-22 Inspector's report.

(a) Required to be clear, legible, and in following form:

(Place) _____

(Date) _____

Gas cylinders

Manufactured for _____ Company
Location at _____

¹ Symbol in front of or following the number with ample space between is also authorized. Other variation in location authorized only when necessitated by lack of space.

Manufactured by _____ Company
Location at _____
Consigned to _____ Company
Location at _____
Quantity _____
Size _____ inches outside diameter by _____ inches long.

Marks stamped into the shoulder of the cylinder are:

Specification DOT- _____

Serial numbers _____ to _____ inclusive

Inspector's mark _____

Identifying symbol (registered) _____

Test date _____

Tare weights (yes or no) _____

Other marks (if any) _____

These cylinders were made by process of _____

The footrings _____ welded

(were—were not)

as permitted in § 178.43-9.

The material used was identified by the following _____ numbers
(heat-purchase order)

_____ The material used was verified as to chemical analysis and record thereof is attached hereto. The heat numbers _____

(were—were not)

marked on the material.

All material, such as plates, billets and seamless tubing, was inspected and each cylinder was inspected both before and after closing in the ends; all that was accepted was found free from seams, cracks, laminations, and other defects which might prove injurious to the strength of the cylinder. The processes of manufacture and heat treatment of cylinders were supervised and found to be efficient and satisfactory.

The cylinder walls were measured and the minimum thickness noted was _____ inch. The outside diameter was determined by a close approximation to be _____ inches. The wall stress was calculated to be _____ pounds per square inch under an internal pressure of _____ pounds per square inch.

Hydrostatic tests, flattening tests, tensile tests of material, and other tests, as prescribed in specification No. DOT-3A480X were made in the presence of the inspector and all material and cylinders accepted were found to be in compliance with the requirements of that specification. Records thereof are attached hereto.

I hereby certify that all of these cylinders proved satisfactory in every way and comply with the requirements of Department of Transportation specification No. 3A480X except as follows: _____

(Signed) _____

Inspector.

(Place)
(Date)

RECORD OF CHEMICAL ANALYSIS OF MATERIAL FOR CYLINDERS

Numbered to inclusive.
Size inches outside diameter by inches long
Made by Company
For Company

NOTE: Any omission of analyses by heats, if authorized, must be accounted for by notation hereon reading "The prescribed certificate of the manufacturer of material has been secured, found satisfactory, and placed on file," or by attaching a copy of the certificate.

Test No.	Heat No.	Check analysis No.	Cylinders represented (serial Nos.)	Chemical analysis						
				C	P	S	Si	Mn	Ni	Cr

The analyses were made by
(Signed)

(Place)
(Date)

RECORD OF PHYSICAL TESTS OF MATERIAL FOR CYLINDERS

Numbered to inclusive.
Size inches outside diameter by inches long
Made by Company
For Company

Test No.	Cylinders represented by test (Serial Nos.)	Yield strength (pounds per square inch)	Tensile strength (pounds per square inch)	Elongation (percent in 8 inches)	Reduction of area (percent)	Flattening test

(Signed)

(Place)
(Date)

RECORD OF HYDROSTATIC TESTS ON CYLINDERS

Numbered to inclusive.
Size inches outside diameter by inches long
Made by Company
For Company

Serial numbers of cylinders tested arranged numerically	Actual test pressure (pounds per square inch)	Total expansion (cubic centimeters) ¹	Permanent expansion (cubic centimeters) ¹	Percent ratio of permanent expansion to total expansion ¹	Tare weight (pounds) ²	Volumetric capacity

¹ If the tests are made by a method involving the measurement of the amount of liquid forced into the cylinder by the test pressure, then the basic data, on which the calculations are made, such as the pump factors, temperature of liquid, coefficient of compressibility of liquid, etc., must also be given.

² Do not include removable cap but state whether with or without valve. These weights must be accurate to a tolerance of 1 percent.

(Signed)

§ 178.44 [Reserved]

§ 178.44-1 thru 178.44-25 [Reserved]

§ 178.45 Specification 3T: seamless steel cylinder.

§ 178.45-1 Compliance.

Each cylinder must meet the applicable requirements of § 173.24 of this subchapter.

§ 178.45-2 Type, size, and service pressure.

(a) *Type.* Each cylinder must be of seamless construction with integrally formed heads concave to pressure at both ends. The inside head shape must be hemispherical, ellipsoidal in which the major axis is two times the minor axis, or a dished shape falling within these two limits. Permanent closures formed by spinning are prohibited.

(b) *Size.* The minimum water capacity is 1,000 pounds.

(c) *Service pressure.* The minimum service pressure is 1,800 p.s.i.

178.45-3 Inspection by whom and where.

Inspections and verifications must be performed by an independent inspection agency. Chemical analyses and tests as specified must be made within the United States.

§ 178.45-4 Duties of the Inspector.

(a) The inspector must determine that all materials are in compliance with the requirements of this specification.

(b) The inspector must verify compliance with the requirements of § 178.45-5 by making a chemical analysis or obtaining a certified chemical analysis from the material manufacturer for each heat of material. If an analysis is not provided by the material manufacturer, a sample from each heat must be analyzed.

(c) The inspector must determine that each cylinder is made and marked in compliance with this specification by:

- (1) Complete internal and external inspection;
- (2) Verification of proper heat treatment;
- (3) Selection of samples to be tested;
- (4) Witnessing all tests;
- (5) Verification of threads by gage; and
- (6) Preparation of required report.

§ 178.45-5 Material, steel.

(a) Only open hearth, basic oxygen, or electric furnace process steel of uniform quality is authorized. The steel analysis must conform to the following:

ANALYSES TOLERANCES

Element (percent)	Ladle analysis	Check analysis	
		Under	Over
Carbon.....	0.35 to 0.50.....	0.03	0.04
Manganese.....	0.75 to 1.05.....	0.04	0.04
Phosphorus (max).....	0.035.....		0.01
Sulfur (max).....	0.04.....		0.01
Silicon.....	0.15 to 0.35.....	0.02	0.03
Chromium.....	0.80 to 1.15.....	0.05	0.05
Molybdenum.....	0.15 to 0.25.....	0.02	0.02

(b) A heat of steel made under these specifications, the ladle analysis of which is slightly out of the specified range, is acceptable if satisfactory in all other aspects. However, the check analysis tolerances shown in the above table may not be exceeded except as approved by the Department.

(c) Material with seams, cracks, laminations, or other injurious defects is not permitted.

(d) Material used must be identified by any suitable method.

§ 178.45-6 Manufacture.

(a) General manufacturing requirements are as follows:

- (1) Dirt and scale must be removed prior to inspection and processing.
- (2) Surface finish must be uniform and reasonably smooth.
- (3) Inside surfaces must be clean, dry, and free of loose particles.
- (4) No defect of any kind is permitted if it is likely to weaken a finished cylinder.

(b) If the cylinder surface is not originally free from the defects described in paragraph (a) of this section, the surface may be machined or otherwise treated to eliminate these defects provided the minimum wall thickness is maintained.

(c) Welding or brazing on a cylinder is not permitted.

§ 178.45-7 Wall thickness.

(a) The minimum wall thickness must be such that the wall stress at the minimum specified test pressure does not exceed 67 percent of the minimum tensile strength of the steel as determined by the physical tests required in §§ 178.45-14 and 178.45-15. A wall stress of more than 90,500 p.s.i. is not permitted. The minimum wall thickness for any cylinder may not be less than 0.325 inch.

(b) Calculation of the stress for cylinders must be made by the following formula:

$$S = \frac{P(1.3D^2 + 0.4d^2)}{D^2 - d^2}$$

where:

S=Wall stress in pounds per square inch;
P=Minimum test pressure, at least 5/3 service pressure;
D=Outside diameter in inches;
d=Inside diameter in inches.

(c) Each cylinder must meet the following additional requirements which assumes a cylinder horizontally supported at its two ends and uniformly loaded over its entire length. This load consists of the weight per inch of length of the straight cylindrical portion filled with water compressed to the specified test pressure. The wall thickness must be increased when necessary to meet this additional requirement.

(1) The sum of two times the maximum tensile stress in the bottom fibers due to bending (see paragraph (c) (1) (i) of this section), plus the maximum tensile stress in the same fibers due to hydrostatic testing (see paragraph (c) (1) (ii) of this section) may not exceed 80 per cent of the minimum yield strength of the steel at this maximum stress.

(i) The following formula must be used to calculate the maximum tensile stress due to bending:

$$S = \frac{Mc}{I}$$

where:

S=Tensile stress in pounds per square inch;
M=Bending moment in inch-pounds $\left(\frac{wl^2}{8}\right)$
I=Moment of inertia—0.04909 $(D^4 - d^4)$ in inches fourth;
c=Radius $\left(\frac{D}{2}\right)$ of cylinder in inches;
w=Weight per inch of cylinder filled with water;
l=Length of cylinder in inches;
D=Outside diameter in inches;
d=Inside diameter in inches.

(ii) The following formula must be used to calculate the maximum longitudinal tensile stress due to hydrostatic test pressure:

$$S = \frac{A_1 P}{A_2}$$

where:

S=Tensile stress in pounds per square inch;
A₁=Internal area in cross section of cylinder in square inches;
P=Hydrostatic test pressure in pounds per square inch;
A₂=Area of metal in cross section of cylinder in square inches.

§ 178.45-8 Heat treatment.

(a) Each completed cylinder must be uniformly and properly heat treated prior to testing, as follows:

(1) Each cylinder must be heated and held at the proper temperature for at least one hour per inch of thickness based on the maximum thickness of the cylinder and then quenched in a suitable liquid medium having a cooling rate not in excess of 80 per cent of water. The steel temperature on quenching must be that recommended for the steel analysis, but it must never exceed 1750° F.

(2) After quenching, each cylinder must be reheated to a temperature below the transformation range but not less than 1050° F., and must be held at this temperature for at least one hour per inch of thickness based on the maximum thickness of the cylinder. Each cylinder must then be cooled under conditions recommended for the steel.

§ 178.45-9 Openings.

(a) Openings are permitted on heads only.

(b) The size of any centered opening in a head may not exceed one half the outside diameter of the cylinder.

(c) Openings in a head must have ligaments between openings of at least three times the average of their hole diameter. No off-center opening may exceed 2.625 inches in diameter.

(d) All openings must be circular.

(e) All openings must be threaded. Threads must be in compliance with the following:

(1) Each thread must be clean cut, even, without any checks, and to gage.

(2) Taper threads, when used, must be the American Standard Pipe thread (NPT) type and must be in compliance with the requirements of NBS Handbook H-28, Part II, Section VII.

(3) Taper threads conforming to National Gas Taper thread (NGT) standards must be in compliance with the requirements of NBS Handbook H-28, Part II, Sections VII and IX.

(4) Straight threads conforming with National Gas Straight thread (NGS) standards are authorized. These threads must be in compliance with the requirements of NBS Handbook H-28, Part II, Sections VII and IX.

§ 178.45-10 Safety devices and protection for valves, safety devices, and other connections.

Safety devices and protection arrangements for valves, safety devices, and other connections must be in compliance with § 173.34(d) of this subchapter. See also § 173.301(l) of this subchapter.

§ 178.45-11 Hydrostatic test.

(a) Each cylinder must be tested at an internal pressure by the water jacket method or other suitable method. The testing apparatus must be operated in a manner that will obtain accurate data. Any pressure gage used must permit reading to an accuracy of one percent. Any expansion gage used must permit reading of the total expansion to an accuracy of one percent.

(b) Any internal pressure applied to the cylinder after heat treatment and before the official test may not exceed 90 percent of the test pressure.

(c) The pressure must be maintained sufficiently long to assure complete expansion of the cylinder. In no case may the pressure be held less than 30 seconds.

(d) If, due to failure of the test apparatus, the required test pressure cannot be maintained, the test must be repeated at a pressure increased by 10 percent or 100 p.s.i., whichever is lower or, the cylinder must be reheat treated.

(e) Permanent volumetric expansion of the cylinder may not exceed 10 percent of its total volumetric expansion at the required test pressure.

(f) Each cylinder must be tested to at least $5/3$ times its service pressure.

§ 178.45-12 Ultrasonic examination.

After the hydrostatic test, the cylindrical section of each vessel must be examined in accordance with ASTM Standard A-388-67 using the angle beam technique. The equipment used must be calibrated to detect a notch equal to five percent of the design minimum wall thickness. Any discontinuity indication greater than that produced by the five percent notch shall be cause for rejection of the cylinder unless the discontinuity is repaired within the requirements of this specification.

§ 178.45-13 Basic requirements for tension and Charpy impact tests.

(a) When the cylinders are heat treated in a batch furnace, two tension specimens and three Charpy impact

specimens must be tested from one of the cylinders or a test ring from each batch. The lot size represented by these tests may not exceed 200 cylinders.

(b) When the cylinders are heat treated in a continuous furnace, two tension specimens and three Charpy impact specimens must be tested from one of the cylinders or a test ring from each four hours or less of production. However, in no case may a test lot based on this production period exceed 200 cylinders.

(c) Each specimen for the tension and Charpy impact tests must be taken from the side wall of a cylinder or from a ring which has been heat treated with the finished cylinders of which the specimens must be representative. The axis of the specimens must be parallel to the axis of the cylinder. Each cylinder or ring specimen for test must be of the same diameter, thickness, and metal as the finished cylinders they represent. A test ring must be at least 24 inches long with ends covered during the heat treatment process so as to simulate the heat treatment process of the finished cylinders it represents.

(d) A test cylinder or test ring need represent only one of the heats in a furnace batch provided the other heats in the batch have previously been tested and have passed the tests and that such tests do not represent more than 200 cylinders from any one heat.

(e) The test results must conform to the requirements specified in §§ 178.45-14 and 178.45-15.

(f) When the test results do not conform to the requirements specified, the cylinders represented by the tests may be reheat treated and the tests repeated. Paragraph (e) of this section applies to any retesting.

§ 178.45-14 Basic conditions for acceptable physical testing.

(a) The following criteria must be followed to obtain acceptable physical test results:

(1) Each tension specimen must have a gage length of two inches with a width not exceeding one and one-half inches. Except for the grip ends, the specimen may not be flattened. The grip ends may be flattened to within one inch of each end of the reduced section.

(2) A specimen may not be heated after heat treatment specified in § 178.45-8.

(3) The yield strength in tension must be the stress corresponding to a perma-

nent strain of 0.2 percent of the gage length.

(i) This yield strength must be determined by the "offset" method or the "extension under load" method described in ASTM Standard E8-69.

(ii) For the "extension under load" method, the total strain (or extension under load) corresponding to the stress at which the 0.2 percent permanent strain occurs may be determined with sufficient accuracy by calculating the elastic extension of the gage length under appropriate load and adding thereto 0.2 percent of the gage length. Elastic extension calculations must be based on an elastic modulus of 30,000,000. However, when the degree of accuracy of this method is questionable the entire stress-strain diagram must be plotted and the yield strength determined from the 0.2 percent offset.

(iii) For the purpose of strain measurement, the initial strain must be set with the specimen under a stress of 12,000 p.s.i. and the strain indicator reading set at the calculated corresponding strain.

(iv) The cross-head speed of the testing machine may not exceed $\frac{1}{8}$ inch per minute during the determination of yield strength.

(4) Each impact specimen must be Charpy V-notch type size 10 mm x 10 mm taken in accordance with paragraph 11 of ASTM Standard A-333-67. When a reduced size specimen is used, it must be the largest size obtainable.

§ 178.45-15 Acceptable physical test results.

(a) Results of physical tests must conform to the following:

(1) The tensile strength may not exceed 155,000 p.s.i.

(2) The elongation must be at least 16 percent for a two-inch gage length.

(3) The Charpy V-notch impact properties for the three impact specimens which must be tested at 0° F. may not be less than the values shown below:

Size of specimen (mm)	Average value for acceptance 3 specimens	Minimum value 1 specimen only of the three
10.0x10.0.....	25.0 ft. lbs.....	20.0 ft. lbs.
10.0x7.5.....	21.0 ft. lbs.....	17.0 ft. lbs.
10.0x5.0.....	17.0 ft. lbs.....	14.0 ft. lbs.

(4) After the final heat treatment, each vessel must be hardness tested on

the cylindrical section. The tensile strength equivalent of the hardness number obtained may not be more than 165,000 p.s.i. (Rc 36). When the result of a hardness test exceeds the maximum permitted, two or more retests may be made; however, the hardness number obtained in each retest may not exceed the maximum permitted.

§ 178.45-16 Rejected cylinders.

(a) Reheat treatment is authorized. However, each reheat treated cylinder must subsequently pass all the prescribed tests.

(b) Repair by welding is not authorized.

§ 178.45-17 Markings.

(a) Marking must be done by stamping into the metal of the cylinder. All markings must be legible and located on a shoulder.

(b) Required markings are as follows:

(1) "DOT-3T," followed by the service pressure (for example: "DOT-3T1800");

(2) The appropriate serial number;

(3) The registration number of the manufacturer ("M ****");

(4) The inspector's official mark near the serial number;

(5) The tare weight in pounds; and

(6) The date of the test (for example "5-72" for May 1972), so placed that dates of subsequent tests may be easily added.

(c) Markings must be at least $\frac{1}{2}$ inch high.

(d) The markings prescribed by paragraphs (b) (1), (2), and (3) of this section must be displayed one immediately below the previous one as follows:

DOT-3T1800
1234
M 6789

(e) No person may mark any cylinder with the specification identification "DOT-3T" unless (1) it was manufactured in compliance with the requirements of this section and (2) its manufacturer has a registration number (M ****) from the Office of Hazardous Materials, Department of Transportation, Washington, D.C. 20590.

§ 178.45-18 Inspector's report.

(a) The inspector's report must be retained indefinitely by the manufacturer as long as DOT-3T cylinders are authorized for use by these regulations and a copy must be supplied the purchaser and

§ 178.47 [Reserved]

§ 178.47-1 thru 178.47-23 [Reserved]

§ 178.48 Specification 4; forge welded steel cylinders.

§ 178.48-1 Compliance.

(a) Required in all details.

§ 178.48-2 Type, size, and service pressure.

(a) *Type and size.* Must be welded type; forge lap-welded seams required; not over 1,000 pounds water capacity (nominal).

(b) *Service pressure.* Must be 300 pounds per square inch.

§ 178.48-3 Inspection by whom and where.

Inspections and verifications must be performed by an independent inspection agency. Chemical analyses and tests as specified must be made within the United States.

§ 178.48-4 Duties of inspector.

(a) Inspect all material and reject any not complying with requirements; for cylinders made by billet-piercing process, billets to be inspected after nick and cold break.

(b) Verify chemical analysis of each heat of material by analysis or by obtaining certified analysis: *Provided*, That a certificate from the manufac-

turer thereof, giving sufficient data to indicate compliance with requirements, is acceptable when verified by check analyses of samples taken from one cylinder out of each lot of 200 or less.

(c) Verify compliance of cylinders with all requirements including markings; inspect inside before closing in both ends; verify heat treatment as proper; obtain samples for all tests and check chemical analyses; witness all tests; verify threads by gauge; report volumetric capacity and tare weight (see report form) and minimum thickness of wall noted.

(d) Render complete report (§ 178.48-21) to purchaser and cylinder maker.

§ 178.48-5 Steel.

(a) Open-hearth, basic oxygen, or electric steel of uniform quality. Content percent for the following not over: Carbon, 0.25; phosphorus, 0.045; sulfur, 0.050. However, Bessemer steel with phosphorus not over 0.11 percent is authorized when carbon content is 2.20 percent or less.

§ 178.48-6 Identification of material.

(a) Required; any suitable method.

§ 178.48-7 Defects.

(a) Material with seams, cracks, laminations, or other injurious defects, not authorized.

§ 178.48-8 Manufacture.

(a) By best appliances and methods; dirt and scale to be removed as necessary to afford proper inspection; no fissure or other defect acceptable that is likely to

weaken the finished cylinder appreciably; reasonably smooth and uniform surface finish required. Cylinders closed in by spinning process not authorized.

§ 178.48-9 Brazing or welding.

(a) The attachment to the tops and bottoms only of cylinders by welding or brazing of neckrings, footrings, handles, bosses, pads, and valve protection rings is authorized: *Provided*, That such attachments and the portion of the container to which they are attached are made of weldable steel, the carbon content of which must not exceed 0.25 percent except in the case of 4130X steel which may be used with proper welding procedure.

§ 178.48-10 Wall thickness.

(a) The wall stress shall not exceed 18,000 pounds per square inch. Minimum wall 0.100" for any cylinder over 5" outside diameter.

(b) Calculations must be made by the formula:

$$S = \frac{P(1.3D^2 + 0.4d^2)}{D^2 - d^2}$$

where

S = wall stress in pounds per square inch;
 P = 700 pounds per square inch;
 D = outside diameter in inches;
 d = inside diameter in inches.

§ 178.48-11 Heat treatment.

(a) The completed cylinders must be uniformly and properly heat treated. Heat treatment after tests is authorized.

§ 178.48-12 Openings in cylinders and connections (valves, fuse plugs, etc.) for those openings.

(a) Threads required, to be clean cut, even, without checks, and to gauge.

(b) Taper threads, required; to be of length not less than as specified for American Standard taper pipe threads.

§ 178.48-13 Safety devices and protection for valves, safety devices, and other connections, if applied

(a) Must be as required by the Department's regulations that apply (see §§ 173.34(d) and 173.301(g) of this chapter).

§ 178.48-14 Hydrostatic test.

(a) By water-jacket, or other suitable method, operated so as to obtain accurate data. Pressure gauge must permit

reading to accuracy of 1 percent. Expansion gauge must permit reading of total expansion to accuracy either of 1 percent or 0.1 cubic centimeter.

(b) Pressure must be maintained for 30 seconds and sufficiently longer to insure complete expansion. Any internal pressure applied after heat-treatment and previous to the official test must not exceed 90 percent of the test pressure. If due to failure of the test apparatus, the test pressure cannot be maintained, the test may be repeated at a pressure increased by 10 percent or 100 pounds per square inch, whichever is the lower.

(c) Permanent volumetric expansion must not exceed 10 percent of total volumetric expansion at test pressure.

(d) Each cylinder must be tested to pressure of at least 700 pounds per square inch.

§ 178.48-15 Flattening test.

(a) Between knife edges, wedge shaped, 60 angle, rounded to $\frac{1}{2}$ " radius; test 1 cylinder¹ taken at random out of each lot of 200 or less, after hydrostatic test.

§ 178.48-16 Physical test.

(a) To determine yield strength, tensile strength, elongation, and reduction of area of material. Required on 2 specimens cut from 1¹ cylinder, or part thereof heat-treated as required, taken at random out of each lot of 200 or less.

(b) Specimens must be: Gauge length 8 inches with width not over $1\frac{1}{2}$ inches, or, gauge length 2 inches with width not over $1\frac{1}{2}$ inches: *Provided*, That gauge length at least 24 times thickness with width not over 6 times thickness is authorized when cylinder wall is not over $\frac{3}{16}$ inch thick. The specimen, exclusive of grip ends, must not be flattened. Grip ends may be flattened to within one inch of each end of the reduced section. When size of cylinder does not permit securing straight specimens, the specimens may be taken in any location or direction and may be straightened or flattened cold, by pressure only, not by blows; when specimens are so taken and prepared, the inspector's report must show in connection with record of physical tests detailed information in regard to such specimens.

¹ For lots of 30 or less, physical and flattening tests are authorized to be made on a ring at least 8 inches long cut from each cylinder and subjected to same heat treatment as the finished cylinder.

Heating of specimen for any purpose is not authorized.

(c) The yield strength in tension shall be the stress corresponding to a permanent strain of 0.2 percent of the gauge length.

(1) The yield strength shall be determined by either the "offset" method or the "extension under load" method as prescribed in ASTM Standard E8-57T.

(2) In using the "extension under load" method, the total strain (or "extension under load") corresponding to the stress at which the 0.2 percent permanent strain occurs may be determined with sufficient accuracy by calculating the elastic extension of the gauge length under appropriate load and adding thereto 0.2 percent of the gauge length. Elastic extension calculations shall be based on an elastic modulus of 30,000,000. In the event of controversy, the entire stress-strain diagram shall be plotted and the yield strength determined from the 0.2 percent offset.

(3) For the purpose of strain measurement, the initial strain shall be set while the specimen is under a stress of 12,000 pounds per square inch, the strain indicator reading being set at the calculated corresponding strain.

(4) Cross-head speed of the testing machine shall not exceed $\frac{1}{8}$ inch per minute during yield strength determination.

§ 178.48-17 Acceptable results for physical and flattening tests.

(a) Elongation at least 40 percent for 2 inch gauge length or at least 20 percent in other cases; yield strength not over 73 percent of tensile strength; flattening test not required.

Exception: Flattening test is required without cracking, to 6 times wall thickness when cylinders are made of lap-welded pipe; in such case rings (crop ends) cut from each end of pipe must be tested with weld 45° or less from point of greatest stress; if a ring fails, another from the same end of pipe may be tested.

§ 178.48-18 Rejected cylinders.

(a) Reheat treatment authorized; subsequent thereto, acceptable cylinders must pass all prescribed tests. Repair by welding is authorized.

§ 178.48-19 Marking.

(a) Marking on each cylinder by stamping plainly and permanently on shoulder, top head, or neck, provided that cylinders not less than 0.090" thick

may be stamped on the side wall adjacent to the top head, as follows:

(1) DOT-4.

(2) A serial¹ number and an identifying symbol (letters); location² of number to be just below or immediately following the DOT mark; location² of symbol to be just below or immediately following the number. The symbol and numbers must be those of person making DOT mark. The symbol must be registered with the Bureau of Explosives; duplications unauthorized.

Examples:

DOT-4

1234

XY

DOT-4-1234-XY

(3) Inspector's official mark near serial number; date of test (such as 5-50 for May 1950), so placed that dates of subsequent tests can be easily added.

§ 178.48-20 Size of marks.

(a) At least $\frac{1}{4}$ " high if space permits.

§ 178.48-21 Inspector's report.

(a) Required to be clear, legible, and in the following form:

(Place) _____
(Date) _____

Gas cylinders

Manufactured by _____ Company
Location at _____
Manufactured by _____ Company
Location at _____
Consigned to _____ Company
Location at _____
Quantity _____

Size _____ inches outside diameter by _____ inches long.

Marks stamped into the shoulder of the cylinder are:

Specification DOT— _____
Serial numbers _____ to _____ inclusive
Inspector's mark _____
Identifying symbol (registered) _____
Test date _____
Tare weights (yes or no) _____
Other marks (if any) _____
These cylinders were made by process of _____

¹ Lot numbers, not over 500 cylinders in each lot, authorized for cylinders not over 2 inches outside diameter.

² Symbol in front of or following the number with ample space between is also authorized. Other variation in location authorized only when necessitated by lack of space.

The _____ permitted
(neckrings, footrings, etc.)
in § 178.48-9 were attached by process of

(welding—brazing)
The material used was identified by the
following _____
(heat-purchase order)
numbers _____

The material used was verified as to chemical analysis and record thereof is attached hereto. The heat numbers _____
(were—were not)
marked on the material.

All material such as plates, billets and seamless tubing, was inspected and each cylinder was inspected both before and after closing in the ends; all that was accepted was found free from seams, cracks, laminations, and other defects which might prove injurious to the strength of the cylinder. The processes of manufacture and heat treatment of cylinders were supervised and found to be efficient and satisfactory.

The cylinder walls were measured and the minimum thickness noted was ____ inch. The outside diameter was determined by a close approximation to be ____ inches. The wall stress was calculated to be ____ pounds per square inch under an internal pressure of ____ pounds per square inch.

Hydrostatic tests, flattening tests, tensile tests of material, and other tests, as prescribed in specification No. DOT-4 were made in the presence of the inspector and all material and cylinders accepted were found to be in compliance with the requirements of that specification. Records thereof are attached hereto.

I hereby certify that all of these cylinders proved satisfactory in every way and comply with the requirements of Department of Transportation specification No. 4 except as follows:

Exceptions _____

(Signed) _____

Inspector.

(Place) _____
(Date) _____

RECORD OF CHEMICAL ANALYSIS OF MATERIAL FOR CYLINDERS

Numbered _____ to _____ inclusive.
Size _____ inches outside diameter by _____ inches long
Made by _____ Company
For _____ Company

NOTE: Any omission of analyses by heats, if authorized, must be accounted for by notation hereon reading "The prescribed certificate of the manufacturer of material has been secured, found satisfactory, and placed on file," or by attaching a copy of the certificate.

Test No.	Heat No.	Check analysis No.	Cylinders represented (serial Nos.)	Chemical analysis						
				C	P	S	Si	Mn	Ni	Cr

The analyses were made by _____

(Signed) _____

(Place) _____
(Date) _____

RECORD OF PHYSICAL TESTS OF MATERIAL FOR CYLINDERS

Numbered _____ to _____ inclusive.
Size _____ inches outside diameter by _____ inches long
Made by _____ Company
For _____ Company

Test No.	Cylinders represented by test (Serial Nos.)	Yield strength (pounds per square inch)	Tensile strength (pounds per square inch)	Elongation (percent in 8 inches)	Reduction of area (percent)	Flattening test

(Signed) _____

§ 178.49-8 Manufacture.

(a) By best appliances and methods; dirt and scale to be removed as necessary to afford proper inspection; no fissure or other defect acceptable that is likely to weaken the finished cylinder appreciably; reasonably smooth and uniform surface finish required. Cylinders closed in by spinning process not authorized.

§ 178.49-9 Welding or brazing.

(a) The attachment to the tops and bottoms only of cylinders by welding or brazing of neckrings, footrings, handles, bosses, pads, and valve protection rings is authorized provided that such attachments and the portion of the container to which they are attached are made of weldable steel, the carbon content of which must not exceed 0.25 percent except in the case of 4130X steel which may be used with proper welding procedure.

§ 178.49-10 Wall thickness.

(a) The wall stress shall not exceed 18,000 pounds per square inch for cylinders with longitudinal side seam nor 24,000 pounds per square inch for cylinders without such seam. Minimum wall 0.100" for any cylinder over 5" outside diameter.

(b) Calculation must be made by the formula:

$$S = \frac{P(1.3D^2 + 0.4d^2)}{D^2 - d^2}$$

where

S = wall stress in pounds per square inch;
 P = minimum test pressure prescribed for water jacket test or 450 pounds per square inch whichever is the greater;
 D = outside diameter in inches;
 d = inside diameter in inches.

§ 178.49-11 Heat treatment.

(a) Body and heads formed by drawing or pressing must be uniformly and properly heat treated prior to tests.

§ 178.49-12 Openings in cylinders and connections (valves, fuse plugs, etc.) for these openings.

(a) Threads required, to be clean cut, even, without checks, and to gauge.

(b) Taper threads, when used, to be of length not less than as specified for American Standard taper pipe threads.

(c) Straight threads having at least 6 engaged threads are authorized; to have tight fit and calculated shear strength at least 10 times the test pres-

sure of the cylinder: gasket required, adequate to prevent leakage.

§ 178.49-13 Safety devices and protection for valves, safety devices, and other connections, if applied.

(a) Must be as required by the Department's regulations that apply (see §§ 173.34(d) and 173.301(g) of this chapter).

§ 178.49-14 Hydrostatic test.

(a) By water-jacket, or other suitable method, operated so as to obtain accurate data. Pressure gauge must permit reading to accuracy of 1 percent. Expansion gauge must permit reading of total expansion to accuracy either of 1 percent or 0.1 cubic centimeter.

(b) Pressure must be maintained for 30 seconds and sufficiently longer to insure complete expansion. Any internal pressure applied after heat-treatment and previous to the official test must not exceed 90 percent of the test pressure. If, due to failure of the test apparatus the test pressure cannot be maintained, the test may be repeated at a pressure increased by 10 percent or 100 pounds per square inch, whichever is the lower.

(c) Permanent volumetric expansion must not exceed 10 percent of total volumetric expansion at test pressure.

(d) Each cylinder must be tested to at least $\frac{5}{8}$ times service pressure.

§ 178.49-15 Flattening test.

(a) Between knife edges, wedge shaped, 60° angle, rounded to $\frac{1}{2}$ " radius; test 1 cylinder¹ taken at random out of each lot of 200 or less, after hydrostatic test.

§ 178.49-16 Physical test.

(a) To determine yield strength, tensile strength, elongation, and reduction of area of material. Required on 2 specimens cut from 1¹ cylinder, or part thereof heat-treated as required, taken at random out of each lot of 200 or less.

(b) Specimens must be: Gauge length 8 inches with width not over 1½ inches; or, gauge length 2 inches with width

¹ For lots of 30 or less, physical and flattening tests are authorized to be made on a ring at least 8 inches long cut from each cylinder and subjected to same heat treatment as the finished cylinder.

not over $1\frac{1}{2}$ inches: *Provided*, That gauge length at least 24 times thickness with width not over 6 times thickness is authorized when cylinder wall is not over $\frac{3}{16}$ inch thick. The specimen, exclusive of grip ends, must not be flattened. Grip ends may be flattened to within one inch of each end of the reduced section. When size of cylinder does not permit securing straight specimens, the specimens may be taken in any location or direction and may be straightened or flattened cold, by pressure only, not by blows, when specimens are so taken and prepared, the inspector's report must show in connection with record of physical tests detailed information in regard to such specimens. Heating of specimen for any purpose is not authorized.

(c) The yield strength in tension shall be the stress corresponding to a permanent strain of 0.2 percent of the gauge length.

(1) The yield strength shall be determined by either the "offset" method or the "extension under load" method as prescribed in ASTM Standard E8-57T.

(2) In using the "extension under load" method, the total strain (or "extension under load") corresponding to the stress at which the 0.2 percent permanent strain occurs may be determined with sufficient accuracy by calculating the elastic extension of the gauge length under appropriate load and adding thereto 0.2 percent of the gauge length. Elastic extension calculations shall be based on an elastic modulus of 30,000,000. In the event of controversy, the entire stress-strain diagram shall be plotted and the yield strength determined from the 0.2 percent offset.

(3) For the purpose of strain measurement, the initial strain shall be set while the specimen is under a stress of 12,000 pounds per square inch, the strain indicator reading being set at the calculated corresponding strain.

(4) Cross-head speed of the testing machine shall not exceed $\frac{1}{8}$ inch per minute during yield strength determination.

§ 178.49-17 Acceptable results for physical and flattening tests.

(a) Elongation at least 40 percent for 2 inch gauge length or at least 20 percent in other cases; yield strength not over

73 percent of tensile strength; flattening test not required.

Exception: Flattening test is required, without cracking, to 6 times wall thickness when cylinders are made of lap-welded pipe; in such case rings (crop ends) cut from each end of pipe must be tested with weld 45° or less from point of greatest stress. If a ring fails, another from the same end of pipe may be tested.

§ 178.49-18 Rejected cylinders.

(a) Reheat treatment authorized; subsequent thereto, acceptable cylinders must pass all prescribed tests. Repair by welding is authorized.

§ 178.49-19 Marking.

(a) Marking on each cylinder by stamping plainly and permanently on shoulder, top head, or neck, provided that cylinders not less than 0.090" thick may be stamped on the side wall adjacent to the top head, as follows:

(1) DOT-4A followed by the service pressure (for example, DOT-4A300, etc.).

(2) A serial¹ number and an identifying symbol (letters); location² of number to be just below or immediately following the DOT mark; location² of symbol to be just below or immediately following the number. The symbol and numbers must be those of person making DOT mark. The symbol must be registered with the Bureau of Explosives; duplication unauthorized.

Examples:

DOT-4A300
1234
XY
DOT-4A300-1234-XY

(3) Inspector's official mark near serial number; date of test (such as 5-50 for May 1950), so placed that dates of subsequent tests can be easily added.

¹ Lot numbers, not over 500 cylinders in each lot, authorized for cylinders not over 2 inches outside diameter and for cylinders over 2 inches outside diameter when the volumetric capacity does not exceed 60 cubic inches.

² Symbol in front of or following the number with ample space between is also authorized. Other variation in location authorized only when necessitated by lack of space.

§ 178.49-20 Size of marks.

(a) At least $\frac{1}{4}$ " high if space permits.

§ 178.49-21 Inspector's report.

(a) Required to be clear, legible, and in following form:

(Place) _____
(Date) _____

Gas cylinders

Manufactured for _____ Company
Location at _____
Manufactured by _____ Company
Location at _____
Consigned to _____ Company
Location at _____
Quantity _____
Size _____ inches outside diameter by _____ inches long.

Marks stamped into the shoulder of the cylinders are:

Specification DOT—
Serial numbers _____ to _____ inclusive.
Inspector's mark _____
Identifying symbol (registered) _____
Test date _____
Tare weights (yes or no) _____
Other marks (if any) _____
These cylinders were made by process of _____

The _____ permitted in (neckrings, footrings, etc.)

§ 178.49-9 were attached by process of _____

(welding—brazing)

The material used was identified by the following _____ numbers (heat-purchase order)

The material used was verified as to chemical analysis and record thereof is attached hereto. The heat numbers _____

(were—were not)

marked on the material.

All material, such as plates, billets and seamless tubing, was inspected and each cylinder was inspected both before and after closing in the ends; all that was accepted was found free from seams, cracks, laminations, and other defects which might prove injurious to the strength of the cylinder. The processes of manufacture and heat treatment of cylinders were supervised and found to be efficient and satisfactory.

The cylinder walls were measured and the minimum thickness noted was _____ inch. The outside diameter was determined by a close approximation to be _____ inches. The wall stress was calculated to be _____ pounds per square inch under an internal pressure of _____ pounds per square inch.

Hydrostatic tests, flattening tests, tensile tests of material, and other tests, as prescribed in specification No. DOT-4A were made in the presence of the inspector and all material and cylinders accepted were found to be in compliance with the requirements of that specification. Records thereof are attached hereto.

I hereby certify that all of these cylinders proved satisfactory in every way and comply with the requirements of Department of Transportation specification No. 4A except as follows:

Exceptions _____

(Signed) _____

Inspector.

(Place) _____

(Date) _____

RECORD OF CHEMICAL ANALYSIS OF MATERIAL FOR CYLINDERS

Numbered _____ to _____ inclusive.
Size _____ inches outside diameter by _____ inches long
Made by _____ Company
For _____ Company

NOTE: Any omission of analyses by heats, if authorized, must be accounted for by notation hereon reading "The prescribed certificate of the manufacturer of material has been secured, found satisfactory, and placed on file," or by attaching a copy of the certificate.

Test No.	Heat No.	Check analysis No.	Cylinders represented (serial Nos.)	Chemical analysis						
				C	P	S	Si	Mn	Ni	Cr

The analyses were made by _____

(Signed) _____

(Place)
(Date)

RECORD OF PHYSICAL TESTS OF MATERIAL FOR CYLINDERS

Numbered to inclusive.
Size inches outside diameter by inches long
Made by Company
For Company

[illegible]

(Signed) _____

(Place).....
(Date).....

RECORD OF HYDROSTATIC TESTS ON CYLINDERS

Numbered to inclusive.
Size inches outside diameter by inches long
Made by Company
For Company

[illegible]

¹ If the tests are made by a method involving the measurement of the amount of liquid forced into the cylinder by the test pressure, then the basic data, on which the calculations are made, such as the pump factors, temperature of liquid, coefficient of compressibility of liquid, etc., must also be given.

² Do not include removable cap but state whether with or without valve. These weights must be accurate to a tolerance of 1 percent.

(Signed)

§ 178.50 Specification 4B; welded and brazed steel cylinders.

§ 178.50-3 Inspection by whom and where.

§ 178.50-1 Compliance.

(a) Required in all details.

§ 178.50-2 Type, size, and service pressure.

(a) *Type and size.* Must be welded or brazed type; longitudinal seams must be forged lap-welded or brazed; not over 1,000 pounds water capacity (nominal). Cylinders closed in by spinning process not authorized.

(b) *Service pressure.*¹ At least 150 to not over 500 pounds per square inch.

¹ The "service pressure" limits the use of the cylinder. It is shown by marks on cylinder, for example, DOT-4B300 indicates the service pressure as 300 pounds per square inch.

Inspections and verifications must be performed by an independent inspection agency or, in the case of cylinders manufactured in the United States, a competent inspector of the manufacturer. Chemical analyses and tests as specified must be made within the United States.

§ 178.50—4 Duties of inspector.

(a) Inspect all material and reject any not complying with requirements; for cylinders made by billet-piercing process.

billets to be inspected after nick and cold break.

(b) Verify chemical analysis of each heat of material by analysis or by obtaining certified analysis: *Provided*, That a certificate from the manufacturer thereof, giving sufficient data to indicate compliance with requirements, is acceptable when verified by check analyses of samples taken from one cylinder out of each lot of 200 or less.

(c) Verify compliance of cylinders with all requirements including markings; inspect inside before closing in both ends; verify heat treatment as proper; obtain samples for all tests and check chemical analyses; witness all tests; verify threads by gauge; report volumetric capacity and tare weight (see report form) and minimum thickness of wall noted.

(d) Render complete report (§ 178.50-21) to purchaser and cylinder maker.

§ 178.50-5 Steel.

(a) Open-hearth, electric or basic oxygen process steel of uniform quality. Content percent for the following not over: Carbon, 0.25; phosphorus, 0.045; sulphur, 0.050.

§ 178.50-6 Identification of material.

(a) Required: any suitable method except that plates and billets for hot-drawn cylinders shall be marked with heat number

§ 178.50-7 Defects.

(a) Material with seams, cracks, laminations, or other injurious defects, not authorized.

§ 178.50-8 Manufacture.

(a) By best appliances and methods; dirt and scale to be removed as necessary to afford proper inspection; no defect acceptable that is likely to weaken the finished cylinder appreciably; reasonably smooth and uniform surface finish required. Exposed bottom welds on cylinders over 18" long must be protected by footings. Seams must be made as follows:

(1) Circumferential seams: By welding or by brazing. Heads attached by brazing must have a driving fit with the shell, unless the shell is crimped, swedged, or curled over the skirt or flange of the head, and be thoroughly brazed until complete penetration by the brazing material of the brazed joint is secured. Depth of brazing from end of shell must

be at least four times the thickness of shell metal.

(2) Longitudinal seams in shells: By forged lap welding, by copper brazing, by copper alloy brazing, or by silver alloy brazing. Copper alloy composition must be: Copper, 95 percent minimum; Silicon, 1.5 percent to 3.85 percent; Manganese, 0.25 percent to 1.10 percent. The melting point of the silver alloy brazing material must be in excess of 1000° F. When brazed, the plate edge must be lapped at least eight times the thickness of plate, laps being held in position, substantially metal to metal, by riveting or electric spot-welding; brazing must be done by using a suitable flux and by placing brazing material on one side of seam and applying heat until this material shows uniformly along the seam of the other side.

§ 178.50-9 Welding or brazing.

(a) The attachment to the tops and bottoms only of cylinders by welding or brazing of neckrings, footrings, handles, bosses, pads, and valve protection rings is authorized: *Provided*, That such attachments and the portion of the container to which they are attached are made of weldable steel, the carbon content of which must not exceed 0.25 percent except in the case of 4130X steel which may be used with proper welding procedure.

§ 178.50-10 Wall thickness.

(a) For outside diameters over 6" the minimum wall thickness shall be 0.090 inch. In any case the minimum wall thickness shall be such that calculated wall stress at minimum test pressure (§ 178.50-14(d)) shall not exceed the following values:

(1) 24,000 pounds per square inch for cylinders without longitudinal seam;

(2) 22,800 pounds per square inch for cylinders having copper brazed or silver alloy brazed longitudinal seam;

(3) 18,000 pounds per square inch for cylinders having forged lapped welded longitudinal seam.

(b) Calculation must be made by the formula:

$$S = \frac{P(1.3D^2 + 0.4d^2)}{D^2 - d^2}$$

where

- S wall stress in pounds per square inch;
- P minimum test pressure prescribed for water jacket test or 450 pounds per square inch whichever is the greater;
- D outside diameter in inches;
- d inside diameter in inches.

§ 178.50-11 Heat treatment.

(a) Body and heads formed by drawing or pressing must be uniformly and properly heat treated prior to tests.

§ 178.50-12 Opening in cylinders.

(a) Each opening in cylinders, except those for safety devices, must be provided with a fitting, boss, or pad, securely attached to cylinder by brazing or by welding or by threads. Fitting, boss, or pad must be of steel suitable for the method of attachment employed, and which need not be identified or verified as to analysis except that if attachment is by welding, carbon content must not exceed 0.25 percent. If threads are used, they must comply with the following:

(1) Threads must be clean cut, even without checks, and tapped to gauge.

(2) Taper threads to be of length not less than as specified for American Standard taper pipe threads.

(3) Straight threads, having at least 4 engaged threads, to have tight fit and calculated shear strength at least 10 times the test pressure of the cylinder; gaskets required, adequate to prevent leakage.

NOTE 1: A brass fitting may be brazed to the steel boss or flange on cylinders used as component parts of hand fire extinguishers.

(b) Closure of fitting, boss, or pad must be adequate to prevent leakage.

§ 178.50-13 Safety devices and protection for valves, safety devices, and other connections, if applied.

(a) Must be as required by the Department's regulations that apply (see §§ 173.34(d), 173.124(a), and 173.301(g) of this chapter).

§ 178.50-14 Hydrostatic test.

(a) By water-jacket, or other suitable method, operated so as to obtain accurate data. Pressure gauge must permit reading to accuracy of 1 percent. Expansion gauge must permit reading of total expansion to accuracy either of 1 percent or 0.1 cubic centimeter.

(b) Pressure must be maintained for 30 seconds and sufficiently longer to insure complete expansion. Any internal pressure applied after heat-treatment

and previous to the official test must not exceed 90 percent of the test pressure. If, due to failure of the test apparatus, the test pressure cannot be maintained, the test may be repeated at a pressure increased by 10 percent or 100 pounds per square inch, whichever is the lower.

(c) Permanent volumetric expansion must not exceed 10 percent of total volumetric expansion at test pressure.

(d) Cylinders must be tested as follows:

(1) At least one cylinder selected at random out of each lot of 200 or less shall be tested as outlined in paragraphs (a), (b), and (c) of this section to at least two times service pressure.

(2) All cylinders not tested as outlined in subparagraph (1) of this paragraph must be examined under pressure of at least two times service pressure and show no defect.

§ 178.50-15 Flattening test.

(a) Between knife edges, wedge shaped, 60° angle, rounded to $\frac{1}{2}$ " radius; test 1 cylinder¹ taken at random out of each lot of 200 or less, after hydrostatic test.

§ 178.50-16 Physical test.

(a) To determine yield strength, tensile strength, elongation, and reduction of area of material. Required on 2 specimens cut from 1¹ cylinder, or part thereof heat-treated as required, taken at random out of each lot of 200 or less.

(b) Specimens must be: Gauge length 8 inches with width not over $1\frac{1}{2}$ inches; or, gauge length 2 inches with width not over $1\frac{1}{2}$ inches; provided, that gauge length at least 24 times thickness with width not over 6 times thickness is authorized when cylinder wall is not over $\frac{3}{4}$ inch thick. The specimen, exclusive of grip ends, must not be flattened. Grip ends may be flattened to within one inch of each end of the reduced section. When size of cylinder does not permit securing straight specimens, the specimens may be taken in any location or direction and may be straightened or flattened cold, by pressure only, not by

¹ For lots of 30 or less, physical and flattening tests are authorized to be made on a ring at least 8 inches long cut from each cylinder and subjected to same heat treatment as the finished cylinder.

blows; when specimens are so taken and prepared, the inspector's report must show in connection with record of physical tests detailed information in regard to such specimens. Heating of specimen for any purpose is not authorized.

(c) The yield strength in tension shall be the stress corresponding to a permanent strain of 0.2 percent of the gauge length.

(1) The yield strength shall be determined by either the "offset" method or the "extension under load" method as prescribed in ASTM Standard E8-57T.

(2) In using the "extension under load" method, the total strain (or "extension under load") corresponding to the stress at which the 0.2 percent permanent strain occurs may be determined with sufficient accuracy by calculating the elastic extension of the gauge length under appropriate load and adding thereto 0.2 percent of the gauge length. Elastic extension calculations shall be based on an elastic modulus of 30,000,000. In the event of controversy, the entire stress-strain diagram shall be plotted and the yield strength determined from the 0.2 percent offset.

(3) For the purpose of strain measurement, the initial strain shall be set while the specimen is under a stress of 12,000 pounds per square inch, the strain indicator reading being set at the calculated corresponding strain.

(4) Cross-head speed of the testing machine shall not exceed $\frac{1}{8}$ inch per minute during yield strength determination.

§ 178.50-17 Acceptable results for physical and flattening tests.

(a) Elongation at least 40 percent for 2 inch gauge length or at least 20 percent in other cases; yield strength not over 73 percent of tensile strength; flattening test not required.

Exception: Flattening test is required, without cracking, to 6 times wall thickness when cylinders are made of lap-welded pipe; in such case rings (crop ends) cut from each end of pipe must be tested with weld 45° or less from point of greatest stress; if a ring fails, another from the same end of pipe may be tested.

§ 178.50-18 Rejected cylinders.

(a) Reheat treatment authorized; subsequent thereto, acceptable cylinders

must pass all prescribed tests. Repair of brazed seams by brazing and welded seams by welding is authorized.

§ 178.50-19 Marking.

(a) Marking on each cylinder by stamping plainly and permanently on shoulder, top head, neck or valve protection collar which is permanently attached to the cylinders and forming an integral part thereof, provided that cylinders not less than 0.090 inches thick may be stamped on the side wall adjacent to top head, as follows:

(1) DOT-4B followed by the service pressure (for example, DOT-4B300, etc.).

(2) A serial¹ number and an identifying symbol (letters); location² of number to be just below or immediately following the DOT mark; location² of symbol to be just below or immediately following the number. The symbol and numbers must be those of person making DOT mark. The symbol must be registered with the Bureau of Explosives; duplications unauthorized.

Examples:

DOT-4B300

1234

XY

DOT-4B300-1234-XY

(3) Inspector's official mark, near serial number; date of test (such as 5-50 for May 1950), so placed that date of subsequent test can be easily added.

§ 178.50-20 Size of marks.

(a) At least $\frac{1}{4}$ " high if space permits.

¹ Lot numbers, not over 500 cylinders in each lot, authorized for cylinders not over 2 inches outside diameter and for cylinders over 2 inches outside diameter when the volumetric capacity does not exceed 170 cubic inches.

² Symbol in front of or following the number with ample space between or symbol and serial number stamped into welded or brazed-on valve spud directly above the DOT specification mark located on head of cylinder are also authorized. Other variations in location authorized only when necessitated by lack of space.

(Place)

(Date)

RECORD OF PHYSICAL TESTS OF MATERIAL FOR CYLINDERS

Numbered to inclusive.
 Size inches outside diameter by inches long
 Made by Company
 For Company

Test No. ¹	Cylinders represented by test (Serial Nos.)	Yield strength (pounds per square inch)	Tensile strength (pounds per square inch)	Elongation (percent in 8 inches)	Reduction of area (percent)	Flattening test

(Signed)

(Place)

(Date)

RECORD OF HYDROSTATIC TESTS ON CYLINDERS

Numbered to inclusive.
 Size inches outside diameter by inches long
 Made by Company
 For Company

Serial numbers of cylinders tested arranged numerically	Actual test pressure (pounds per square inch)	Total expansion (cubic centimeters) ¹	Permanent expansion (cubic centimeters) ¹	Percent ratio of permanent expansion to total expansion ¹	Tare weight (pounds) ²	Volumetric capacity ³

NOTE: When specifications require test for only 1 out of each lot of 200 or less cylinders, the check on the others must be indicated by a notation hereon reading: "Each cylinder was subjected to a pressure of pounds per square inch and showed no defect."

¹ If the tests are made by a method involving the measurement of the amount of liquid forced into the cylinder by the test pressure, then the basic data, on which the calculations are made, such as the pump factors, temperature of liquid, coefficient of compressibility of liquid, etc., must also be given.

² Do not include removable cap but state whether with or without valve. These weights must be accurate to a tolerance of 1 percent.

³ Report approximate maximum and minimum volumetric capacity for the lot.

(Signed)

§ 178.51 Specification 4BA; welded or brazed steel cylinders made of definitely prescribed steels.

§ 178.51-1 Compliance.

(a) Required in all details.

§ 178.51-2 Type, size, and service pressure.

(a) Must be welded or brazed type; not over 1,000 pounds water capacity (nominal); service pressure at least 225 and not over 500 pounds per square inch gauge. Closures welded by the spinning process not permitted.

§ 178.51-3 Inspection by whom and where.

Inspections and verifications must be performed by an independent inspection agency or, in the case of cylinders manufactured in the United States, a competent inspector of the manufacturer. Chemical analyses and test as specified must be made within the United States.

§ 178.51-4 Duties of inspector.

(a) Inspect all material and reject any not complying with requirements of this specification. For cylinders made by the billet-piercing process, billets to be inspected after nick and cold break.

(b) Verify chemical analysis of each heat of material by analysis or by obtaining certified analysis: *Provided*, That a certificate from the manufacturer thereof, giving sufficient data to indicate compliance with requirements, is acceptable when verified by check analyses of samples taken from one cylinder out of each lot of 200 or less.

(c) Verify compliance of cylinders with specification requirements including: markings; condition of inside; tests; threads; heat treatment. Obtain samples for all tests, and check chemical analyses, witness all tests; report volumetric capacity, tare weight (see report form), and minimum thickness of wall noted.

(d) Render complete report (§ 178.51-21) to purchaser and cylinder maker.

§ 178.51-5 Steel.

(a) Designations and limited chemical compositions of steels authorized by this specification shall be as shown in § 178.51-20, Table I.

§ 178.51-6 Identification of material.

(a) Required; any suitable method except that plates and billets for hot-drawn cylinders shall be marked with the heat number.

§ 178.51-7 Defects.

(a) Material with seams, cracks, laminations, or other injurious defects, not authorized.

§ 178.51-8 Manufacture.

(a) By best appliances and methods; dirt and scale to be removed as necessary to afford proper inspection; no defect acceptable that is likely to weaken the finished cylinder appreciably; reasonably smooth and uniform surface finish required. Exposed bottom welds on cylinders over 18 inches long must be protected by footrings. Seams must be made as follows: Minimum thickness of heads and bottoms shall be not less than 90 percent of the required thickness of the side wall.

(b) Circumferential seams. By welding or by brazing. Heads attached by brazing must have a driving fit with the shell,

unless the shell is crimped, swedged or curled over the skirt or flange of the head and must be thoroughly brazed until complete penetration by the brazing material of the brazed joint is secured. Depth of brazing from end of shell must be at least four times the thickness of shell metal.

(c) Longitudinal seams in shells: By copper brazing, copper alloy brazing, or by silver alloy brazing. Copper alloy composition must be: Copper 95 percent minimum, Silicon 1.5 percent to 3.85 percent, Manganese 0.25 percent to 1.10 percent. The melting point of the silver alloy brazing material must be in excess of 1,000° F. The plate edge must be lapped at least eight times the thickness of plate, laps being held in position, substantially metal to metal, by riveting or by electric spot-welding. Brazing must be done by using a suitable flux and by placing brazing material on one side of seam and applying heat until this material shows uniformly along the seam of the other side.

(1) Strength of longitudinal seam: Copper brazed longitudinal seam must have strength at least 3/2 times the strength of the steel wall.

§ 178.51-9 Welding and brazing.

(a) The attachment to the tops and bottoms only of cylinders by welding or brazing of neckrings, footrings, handles, bosses, pads, and valve protection rings is authorized provided that such attachments and the portion of the container to which they are attached are made of weldable steel, the carbon content of which must not exceed 0.25 percent except in the case of 4130X steel which may be used with proper welding procedure.

§ 178.51-10 Wall thickness.

(a) For outside diameters over 6" the minimum wall thickness shall be 0.078". In any case the minimum wall thickness shall be such that the calculated wall stress at minimum test pressure (§ 178.51-14) shall not exceed the lesser value of any of the following:

(1) The value shown in table I, § 178.51-20, for the particular material under consideration;

(2) One-half of the minimum tensile strength of the material determined as required in § 178.51-15;

(3) 35,000 pounds per square inch.

(4) Further provided that wall stress for cylinders having copper brazed longitudinal seams must not exceed 95 percent of any of the above values. Meas-

ured wall thickness shall not include galvanizing or other protective coating.

(b) Calculation must be made by the formula:

$$S = \frac{P(1.3D^2 + 0.4d^2)}{D^2 - d^2}$$

where

S = wall stress in pounds per square inch;
 P = minimum test pressure prescribed for water jacket test;

D = outside diameter in inches;
 d = inside diameter in inches.

(c) Cylinders with wall thickness less than 0.100 inch, the ratio of tangential length to outside diameter shall not exceed 4.0.

§ 178.51-11 Heat treatment.

(a) Each cylinder must be uniformly and properly heat treated prior to test by the applicable method shown in § 178.51-20, Table I. Heat treatment must be accomplished after all forming and welding operations, except that when brazed joints are used, heat treatment must follow any forming and welding operations, but may be done before during or after the brazing operations.

(b) Heat treatment is not required after welding or brazing weldable low carbon parts to attachments of similar material which have been previously welded or brazed to the top or bottom of cylinders and properly heat treated, provided such subsequent welding or brazing does not produce a temperature in excess of 400° F. in any part of the top or bottom material.

§ 178.51-12 Openings in cylinders.

(a) All openings must be in the heads or bases.

(b) Each opening in cylinders, except those for safety devices, must be provided with a fitting, boss, or pad, securely attached to cylinder by brazing, by welding, or by threads. If threads are used they must comply with the following:

(1) Threads must be clean-cut, even, without checks and cut to gauge.

(2) Taper threads to be of length not less than as specified for American Standard taper pipe threads.

(3) Straight threads, having at least 4 engaged threads, to have tight fit and calculated shear strength at least, 10 times the test pressure of the cylinder; gaskets required, adequate to prevent leakage.

(c) Closure of fitting, boss, or pad must be adequate to prevent leakage.

§ 178.51-13 Safety devices and protection for valves, safety devices, and other connections, if applied.

(a) Must be as required by the Department's regulations that apply (see §§ 173.34(d), 173.124(a), and 173.301(g) of this chapter).

§ 178.51-14 Hydrostatic test.

(a) By water jacket, or other suitable method, operated so as to obtain accurate data. Pressure gauge must permit reading to accuracy of 1 percent. Expansion gauge must permit reading of total expansion to accuracy either of 1 percent or 0.1 cubic centimeter.

(b) Pressure must be maintained for 30 seconds and sufficiently longer to insure complete expansion. Any internal pressure applied after heat treatment and previous to the official test must not exceed 90 percent of the test pressure.

(c) Permanent volumetric expansion must not exceed 10 percent of the total volumetric expansion at test pressure.

(d) Cylinders must be tested as follows:

(1) At least one cylinder selected at random out of each lot of 200 or less shall be tested as outlined in paragraphs (a), (b), and (c) of this section to at least two times service pressure.

(2) All cylinders not tested as outlined in subparagraph (1) of this paragraph must be examined under pressure of at least two times service pressure and show no defect.

§ 178.51-15 Physical test.

(a) To determine yield strength, tensile strength, elongation, and reduction of area of material. Required on 2 specimens cut from one cylinder having passed the hydrostatic test, or part thereof heat-treated as required, taken at random out of each lot of 200 or less.

(b) Specimens must be: Gauge length 8 inches with width not over 1½ inches; or, gauge length 2 inches with width not over 1½ inches, provided, that gauge length at least 24 times thickness with width not over 6 times thickness is authorized when cylinder wall is not over 3/16 inch thick. The specimen, exclusive of grip ends, must not be flattened. Grip ends may be flattened to within one inch of each end of the reduced section. When size of the cylinder does not permit securing straight specimens, the specimens

may be taken in any location or direction and may be straightened or flattened cold, by pressure only, not by blows; when specimens are so taken and prepared, the inspector's report must show in connection with record of physical tests detailed information in regard to such specimens. Heating of specimen for any purpose is not authorized.

(c) The yield strength in tension shall be the stress corresponding to a permanent strain of 0.2 percent of the gauge length.

(1) The yield strength shall be determined by either the "offset" method or the "extension under load" method as prescribed in ASTM Standard E8-57T.

(2) In using the "extension under load" method, the total strain (or "extension under load"), corresponding to the stress at which the 0.2 percent permanent strain occurs may be determined with sufficient accuracy by calculating the elastic extension of the gauge length under appropriate load and adding thereto 0.2 percent of the gauge length. Elastic extension calculations shall be based on an elastic modulus of 30,000,000. In the event of controversy, the entire stress-strain diagram shall be plotted and the yield strength determined from the 0.2 percent offset.

(3) For the purpose of strain measurement, the initial strain reference shall be set while the specimen is under a stress of 12,000 pounds per square inch, the strain indicator reading being set at the calculated corresponding strain.

(4) Cross-head speed of the testing machine shall not exceed $\frac{1}{8}$ inch per minute during yield strength determination.

§ 178.51-16 Elongation.

(a) Physical test specimens must show at least 40 percent for 2-inch gauge length or at least 20 percent in other cases, except that these elongation percentages may be reduced numerically by 2 for 2-inch specimens, and by 1 in other cases, for each 7,500 pounds per square inch increment of tensile strength above 50,000 pounds per square inch to a maximum of four such increments.

§ 178.51-17 Tests of welds.

(Does not apply to brazed seams.)

(a) *Tests of welds. Tensile test.* A specimen shall be cut from one cylinder

of each lot of 200 or less, or welded test plate.¹ The specimen must be taken across the major seam and must be prepared and tested in accordance with and must meet the requirements of CGA Pamphlet C-3.

Should this specimen fail to meet the requirements, specimens may be taken from two additional cylinders or welded test plates from the same lot and tested. If either of the latter specimens fail to meet the requirements, the entire lot represented shall be rejected.

(b) *Guided bend test.* A "root" bend test specimen shall be cut from the cylinder or welded test plate, used for the tensile test specified in paragraph (b) of this section. Specimens must be taken across the major seam and must be prepared and tested in accordance with and must meet the requirements of CGA Pamphlet C-3.

(c) *Alternate guided-bend test.* This test may be used and must be as required by CGA Pamphlet C-3. The specimen shall be bent until the elongation at the outer surface, adjacent to the root of the weld, between the lightly scribed gage lines a to b, shall be at least 20 percent, except that this percentage may be reduced for steels having a tensile strength in excess of 50,000 pounds per square inch, as provided in §178.51-16(a).

§ 178.51-18 Rejected cylinders.

(a) Reheat treatment authorized; subsequent thereto, acceptable cylinders must pass all prescribed tests. Repair of brazed seams by brazing and welded seams by welding is authorized.

§ 178.51-19 Marking.

(a) Marking on each cylinder stamped as follows:

¹The welded test plate shall be of one of the heats in the lot of 200 or less which it represents, in the same condition and approximately the same thickness as the cylinder wall except that in no case shall it be of lesser thickness than that required for a one-quarter size Charpy impact specimen. The weld must be made by the same procedures and subjected to the same heat treatment as the major weld on the cylinder.

(1) DOT-4BA followed by the service pressure (for example, DOT-4BA240, etc.).

(2) The serial number and identifying symbol of person making DOT mark. The symbol must be registered with the Bureau of Explosives. Duplications unauthorized. Lot numbers in place of serial numbers authorized for cylinders not over 2 inches outside diameter or for cylinders with volumetric capacity not exceeding 60 cubic inches.

(3) Inspector's official mark.

(4) Date of test (such as 4-50 for April 50).

(5) Additional markings are permitted.

(b) Sequence of marks. Number shall be just below or immediately following the DOT mark; identifying symbol shall be just below or immediately following the number; Inspector's official mark shall be near the serial number. Date of test shall be so placed that dates of subsequent test can easily be added. Symbol in front of or following the number, with space between, or symbol and serial number stamped into welded or brazed-on valve spud directly above the DOT mark located on head of cylinder are also authorized. Other variations in sequence of marks authorized only when necessitated by lack of space.

(c) Location of markings. Markings may be stamped plainly and permanently in the following locations on the cylinder:

(1) On shoulders and top heads not less than 0.087 inch thick.

(2) On side wall adjacent to top head for side walls not less than 0.090 inch thick.

(3) On neck, valve boss, valve protection sleeve, or similar part permanently attached to top end of cylinder.

(4) On a plate attached to the top of the cylinder or permanent part thereof; sufficient space must be left on the plate to provide for stamping at least six retest dates; the plate must be at least $\frac{1}{16}$ inch thick and must be attached by welding, or by brazing at a temperature of at least 1100° F., throughout all edges of the plate.

(5) On a cylindrical portion of the shell which extends beyond the recessed bottom of the cylinder constituting an integral and nonpressure part of the cylinder.

(6) Variations in location of markings authorized only when necessitated by lack of space.

(d) Size of marks. Space permitting at least $\frac{1}{4}$ inch high.

§ 178.51-20 Authorized steel.

(a) As specified in Table I of Appendix A to this part.

§ 178.51-21 Inspector's report.

(a) Required to be clear, legible and in following form:

(Place) -----
(Date) -----

Steel gas cylinders

Manufactured for -----
Location at -----
Manufactured by -----
Location at -----
Consigned to -----
Location at -----
Quantity ----- Size ----- inches outside diameter by ----- inches long
Marks stamped into the -----

(Location of marking)

of the cylinder are:

Specification DOT- -----
Serial numbers ----- to ----- inclusive.
Inspector's mark -----
Identifying symbol (registered) -----
Test date -----
Tare weights (yes or no) -----
Other marks -----

These cylinders were made by process of -----

The material used was type ----- authorized in table I of Spec. No. 4BA.

The material used was identified by the following ----- numbers
(heat-purchase order)

The material used was verified as to chemical analysis and record thereof is attached hereto. The heat numbers -----
(were—were not)

marked on the material.

All material was inspected and all that was accepted was found free from seams, cracks, laminations and other injurious defects.

The compliance of cylinders with specification requirements was verified including markings, condition of inside, tests, threads,

etc. All cylinders with defects which might prove injurious were rejected. The processes of manufacture and heat treatment were supervised and found to be efficient and satisfactory.

The cylinder walls were measured and the minimum thickness noted was _____ inch. The outside diameter was determined by a close approximation to be _____ inches. The wall stress was calculated to be _____ pounds per square inch under an internal pressure of _____ pounds per square inch.

Hydrostatic tests, tensile tests of material, and other tests as prescribed in specification No. DOT-4BA _____ were made in the presence of the inspector and all cylinders accepted were found to be in compliance with

the requirements of that specification. Records thereof are attached hereto.

Each cylinder _____ been equipped
(has-has not)

with safety devices as follows: _____

I hereby certify that all of these cylinders proved satisfactory in every way and comply with the requirements of Department of Transportation specification No. 4BA except as follows:

Exceptions _____

(Manufacturer's name)

Signed _____

Inspector

By _____

(Place) _____

(Date) _____

RECORD OF CHEMICAL ANALYSIS OF STEEL FOR CYLINDERS

Numbered _____ to _____ inclusive.
Size _____ inches outside diameter by _____ inches long
Made by _____ Company
For _____ Company

Test No.	Heat No.	Check analysis No.	Cylinders represented (serial Nos.)	Chemical analysis										
				C	P	S	Si	Mn	Ni	Cr	Mo	Cu	Al	Zr

Steel was manufactured by _____ Company. The originals of the certified mill test reports are in the files of the manufacturer.

NOTE: Any omission of analyses by heats, if authorized, must be accounted for by notation hereon reading "The prescribed certificate of the manufacturer of material has been secured, found satisfactory, and placed on file," or by attaching a copy of the certificate.

Chemical analyses were made by _____

(Place) _____

(Date) _____

RECORD OF PHYSICAL TESTS OF MATERIAL FOR CYLINDERS

Numbered _____ to _____ inclusive.
Size _____ inches outside diameter by _____ inches long
Made by _____ Company
For _____ Company

Test No.	Cylinders represented by test (serial Nos.)	Yield strength (pounds per square inch)	Tensile strength (pounds per square inch)	Elongation (percent in inches)	Reduction of area (percent)	Weld tensile test	Weld bend test

(Signed) .. _____

(Place)
(Date)

RECORD OF HYDROSTATIC TESTS ON CYLINDERS

Numbered to inclusive.
Size inches outside diameter by inches long
Made by Company
For Company

[illegible]

NOTE: When specifications require test for only 1 out of each lot of 200 or less cylinders, the check on the others must be indicated by a notation hereon reading, "Each cylinder was subjected to a pressure of.....pounds per square inch and showed no defect."

¹ If the tests are made by a method involving the measurement of the amount of liquid forced into the cylinder by the test pressure, then the basic data, on which the calculations are made, such as the pump factors, temperature of liquid, coefficient of compressibility of liquid, etc., must also be given.

² Do not include removable cap but state whether with or without valve. These weights must be accurate to a tolerance of 1 percent.

³ Report approximate maximum and minimum volumetric capacity for the lot.

(Signed)

§ 178.52 Specification 4C; welded and brazed steel cylinders.

§ 178.52-1 Compliance.

(a) Required in all details.

§ 178.52-2 Type, size, and service pressure.

(a) *Type and size.* Must be welded or brazed type; longitudinal seams must be forge lap-welded or brazed; not over 1,000 pounds water capacity (nominal). Cylinders closed in by spinning process not authorized.

(b) *Service pressure.*¹ At least 90 to not over 300 pounds per square inch.

§ 178.52-3 Inspection by whom and where.

Inspections and verifications must be performed by an independent inspection agency or, in the case of cylinders manufactured in the United States, a competent inspector of the manufacturer. Chemical analyses and tests as specified must be made within the United States.

¹ The "service pressure" limits the use of the cylinder. It is shown by marks on cylinder; for example, DOT-4C300 indicates the service pressure as 300 pounds per square inch.

§ 178.52-4 Duties of inspector.

(a) Inspect all material and reject any not complying with requirements; for cylinders made by billet-piercing process, billets to be inspected after nick and cold break.

(b) Verify chemical analysis of each heat of material by analysis or by obtaining certified analysis: *Provided*, That a certificate from the manufacturer thereof giving sufficient data to indicate compliance with requirements, is acceptable when verified by check analyses of samples taken from one cylinder out of each lot of 200 or less.

(c) Verify compliance of cylinders with all requirements including markings; inspect inside before closing in both ends; verify heat treatment as proper; obtain samples for all tests and check chemical analyses; witness all tests; verify threads by gauge; report volumetric capacity and tare weight (see report form) and minimum thickness of wall noted.

(d) Render complete report (§ 178.52-21) to purchaser and cylinder maker.

§ 178.52-5 Steel.

(a) Open-hearth, basic oxygen, or electric steel of uniform quality. Content percent for the following not over: Carbon, 0.25; phosphorus, 0.045; sulfur, 0.050.

§ 178.52-6 Identification of material.

(a) Required; any suitable method except that plates and billets for hot-drawn cylinders shall be marked with heat number.

§ 178.52-7 Defects.

(a) Material with seams, cracks, laminations, or other injurious defects, not authorized.

§ 178.52-8 Manufacture.

(a) By best appliances and methods; dirt and scale to be removed as necessary to afford proper inspection; no defect acceptable that is likely to weaken the finished cylinder appreciably; reasonably smooth and uniform surface finish required. Exposed bottom welds on cylinders over 18" long must be protected by footings. Seams must be made as follows:

(1) *Circumferential seams.* By welding or by brazing. Heads attached by brazing must have a driving fit with the shell, unless the shell is crimped, swedged, or curled over the skirt or flange of the head, and be thoroughly brazed until complete penetration by the brazing material of the brazed joint is secured. Depth of brazing from end of shell must be at least four times the thickness of shell metal.

(2) *Longitudinal seams in shells.* By forged lap welding or by copper brazing. When brazed, the plate edge must be lapped at least eight times the thickness of plate, laps being held in position, substantially metal to metal, by riveting or electric spot welding; brazing must be done by placing flux and brazing material on one side of seam and applying heat until this material shows uniformly along the seam on the other side.

§ 178.52-9 Welding or brazing.

(a) The attachment to the tops and bottoms only of cylinders by welding or brazing of neckrings, footings, handles bosses, pads, and valve protection rings

is authorized provided that such attachments and the portion of the container to which they are attached are made of weldable steel, the carbon content of which must not exceed 0.25 percent except in the case of 4130X steel which may be used with proper welding procedure.

§ 178.52-10 Wall thickness.

(a) The wall stress shall not exceed 18,000 pounds per square inch for cylinders with longitudinal side seam nor 24,000 pounds per square inch for cylinders without such seam: *Provided*, That a wall stress of not over 22,800 pounds per square inch is authorized for cylinders with copper brazed side seam having strength at least $3/2$ times the strength of the steel wall. Minimum wall 0.090 inch for any cylinder over 5" outside diameter.

(b) Calculation must be made by the formula:

$$S = \frac{P(1.3D^2 + 0.4d^2)}{D^2 - d^2}$$

where

S =wall stress in pounds per square inch;
 P =test pressure prescribed for water jackets test or 348 pounds per square inch whichever is the greater;
 D =outside diameter in inches;
 d =inside diameter in inches.

§ 178.52-11 Heat treatment.

(a) Body and heads formed by drawing or pressing must be uniformly and properly heat treated prior to tests.

§ 178.52-12 Openings in cylinders and connections (valves, fuse plugs, etc.) for those openings.

(a) Threads required to be clean cut even, without checks, and to gauge.

(b) Taper threads, when used, to be of length not less than as specified for American Standard taper pipe threads.

(c) Straight threads having at least 6 engaged threads are authorized; to have tight fit and calculated shear strength at least 10 times the test pressure of the cylinders; gaskets required, adequate to prevent leakage.

§ 178.52-13 Safety devices and protection for valves, safety devices, and other connections, if applied.

(a) Must be as required by the Department's regulations that apply (see §§ 173.34(d) and 173.301(g) of this chapter).

§ 178.52-14 Hydrostatic test.

(a) By water-jacket, or other suitable method, operated so as to obtain accurate data. Pressure gauge must permit reading to accuracy of 1 percent. Expansion gauge must permit reading of total expansion to accuracy either of 1 percent or 0.1 cubic centimeter.

(b) Pressure must be maintained for 30 seconds and sufficiently longer to insure complete expansion. Any internal pressure applied after heat-treatment and previous to the official test must not exceed 90 percent of the test pressure. If, due to failure of the test apparatus, the test pressure cannot be maintained, the test may be repeated at a pressure increased by 10 percent or 100 pounds per square inch, whichever is the lower.

(c) Permanent volumetric expansion must not exceed 10 percent of total volumetric expansion at test pressure.

(d) Cylinders must be tested as follows: 1 cylinder out of each lot of 200 or less; to 3 times service pressure. Others must be examined under pressure of 2 times service pressure and show no defect. If tested cylinder fails, each cylinder in the lot may be tested; those passing are acceptable.

§ 178.52-15 Flattening test.

(a) Between knife edges, wedge-shaped, 60° angle, rounded to $\frac{1}{2}$ " radius; test 1 cylinder¹ taken at random out of each lot of 200 or less, after hydrostatic test.

§ 178.52-16 Physical test.

(a) Required on 2 specimens cut from 1¹ cylinder, or part thereof heat treated as required, taken at random out of each lot of 200 or less.

(b) Specimens must be: Gauge length 8 inches with width not over $1\frac{1}{2}$ inches; or, gauge length 2 inches with width not over $1\frac{1}{2}$ inches; provided, that gauge length at least 24 times thickness with width not over 6 times thickness is authorized when cylinder wall is not over $\frac{3}{16}$ inch thick. The specimen, exclusive of grip ends, must not be flattened. Grip ends may be flattened to within one inch of each end of the reduced section. When size of cylinder does not permit securing straight specimens, the

¹ For lots of 30 or less, physical and flattening tests are authorized to be made on a ring at least 8 inches long cut from each cylinder and subjected to the same heat treatment as the finished cylinder.

specimens may be taken in any location or direction and may be straightened or flattened cold, by pressure only, not by blows; when specimens are so taken and prepared, the inspector's report must show in connection with record of physical tests detailed information in regard to such specimens. Heating of specimen for any purpose is not authorized.

(c) The yield strength in tension shall be the stress corresponding to a permanent strain of 0.2 percent of the gauge length.

(1) The yield strength shall be determined by either the "offset" method or the "extension under load" method as prescribed in ASTM Standard E8-57T.

(2) In using the "extension under load" method, the total strain (or "extension under load") corresponding to the stress at which the 0.2 percent permanent strain occurs may be determined with sufficient accuracy by calculating the elastic extension of the gauge length under approximate load and adding thereto 0.2 percent of the gauge length. Elastic extension calculations shall be based on an elastic modulus of 30,000,000. In the event of controversy, the entire stress-strain diagram shall be plotted and the yield strength determined from the 0.2 percent offset.

(3) For the purpose of strain measurement, the initial strain shall be set while the specimen is under a stress of 12,000 pounds per square inch, the strain indicator reading being set at the calculated corresponding strain.

(4) Cross-head speed of the testing machine shall not exceed $\frac{1}{8}$ inch per minute during yield strength determination.

§ 178.52-17 Acceptable results for physical and flattening tests.

(a) Elongation at least 40 percent for 2 inch gauge length or at least 20 percent in other cases; yield strength not over 73 percent of tensile strength; flattening test not required.

Exception: Flattening test is required, without cracking, to 8 times wall thickness when cylinders are made of lap-welded pipe; in such case rings (crop ends) cut from each end of pipe must be tested with weld 45° or less from point of greatest stress; if a ring fails, another from the same end of pipe may be tested.

§ 178.52-18 Rejected cylinder.

(a) Reheat treatment authorized; subsequent thereto, acceptable cylinders

must pass all prescribed tests. Repair of brazed seams by brazing and welded seams by welding is authorized.

§ 178.52-19 Marking.

(a) Marking on each cylinder by stamping plainly and permanently on shoulder, top head, or neck, provided that cylinders not less than 0.090" thick may be stamped on the side wall adjacent to the top head, as follows:

(1) DOT-4C followed by the service pressure (for example, DOT-4C300, etc.).

(2) A serial¹ number and an identifying symbol (letters); location² of number to be just below or immediately following the DOT mark; location² of symbol to be just below or immediately following the number. The symbol and numbers must be those of person making DOT mark. The symbol must be registered with the Bureau of Explosives; duplications unauthorized.

Examples:

DOT-4C300
1234
XY
DOT-4C300-1234-XY

(3) Inspector's official mark near serial number; date of test (such as 5-50 for May 1950), so placed that dates of subsequent tests can be easily added.

§ 178.52-20 Size of marks.

(a) At least 1/4" high if space permits.

§ 178.52-21 Inspector's report.

(a) Required to be clear, legible, and in following form:

(Place) -----
(Date) -----

Gas cylinders

Manufactured for ----- Company
Location at -----
Manufactured for ----- Company
Location at -----

¹ Lot numbers, not over 500 cylinders in each lot, authorized for cylinders not over 2 inches outside diameter and for cylinders over 2 inches outside diameter when the volumetric capacity does not exceed 60 cubic inches.

² Symbol in front of or following the number with ample space between is also authorized. Other variation in location authorized only when necessitated by lack of space.

Consigned to ----- Company
Location at -----
Quantity -----
Size ----- inches outside diameter by -----
inches long
Marks stamped into the shoulder of the cylinder are:
Specification DOT- -----
Serial numbers ----- to -----
inclusive.
Inspector's mark -----
Identifying symbol (registered) -----
Test date -----
Tare weights (yes or no) -----
Other marks (if any) -----
These cylinders were made by process of -----

The ----- permitted
(neckrings, footrings, etc.)
in § 178.52-9 were attached by process of -----
(welding—brazing)
The material used was identified by the following ----- numbers
(heat-purchase order)

The material used was verified as to chemical analysis and record thereof is attached hereto. The heat numbers -----
(were—were not)

marked on the material.

All material, such as plates, billets and seamless tubing, was inspected and each cylinder was inspected both before and after closing in the ends; all that was accepted was found free from seams, cracks, laminations and other defects which might prove injurious to the strength of the cylinder. The processes of manufacture and heat treatment of cylinders were supervised and found to be efficient and satisfactory.

The cylinder walls were measured and the minimum thickness noted was ----- inch. The outside diameter was determined by a close approximation to be ----- inches. The wall stress was calculated to be ----- pounds per square inch under an internal pressure of ----- pounds per square inch.

Hydrostatic tests, flattening tests, tensile tests of material, and other tests as prescribed in specification No. DOT-4C were made in the presence of the inspector and all materials and cylinders accepted were found to be in compliance with the requirements of that specification. Records thereof are attached hereto.

I hereby certify that all of these cylinders proved satisfactory in every way and comply with the requirements of Department of Transportation specification No. 4C except as follows:

Exceptions -----

(Signed) -----
Inspector.

(Place).....
(Date).....

RECORD OF CHEMICAL ANALYSIS OF MATERIAL FOR CYLINDERS

Numbered to inclusive.
Size inches outside diameter by inches long
Made by Company
For Company

NOTE: Any omission of analyses by heats, if authorized, must be accounted for by notation hereon reading "The prescribed certificate of the manufacturer of material has been secured, found satisfactory, and placed on file," or by attaching a copy of the certificate.

Test No.	Heat No.	Check analysis No.	Cylinders represented (serial Nos.)	Chemical analysis						
				C	P	S	Si	Mn	Ni	Cr

The analyses were made by
(Signed)

(Place)
(Date)

RECORD OF PHYSICAL TESTS OF MATERIAL FOR CYLINDERS

Numbered to inclusive.
Size inches outside diameter by inches long
Made by Company
For Company

Test No.	Cylinders represented by test (Serial Nos.)	Yield strength (pounds per square inch)	Tensile strength (pounds per square inch)	Elongation (percent in 8 inches)	Reduction of area (percent)	Flattening test

(Signed)

(Place)
(Date)

RECORD OF HYDROSTATIC TESTS ON CYLINDERS

Numbered to inclusive.
Size inches outside diameter by inches long
Made by Company
For Company

Serial Nos. of cylinders tested arranged numerically	Actual test pressure (pounds per square inch)	Total expansion (cubic centimeters) ¹	Permanent expansion (cubic centimeters) ¹	Percent ratio of permanent expansion to total expansion ¹	Tare weight (pounds) ²	Volumetric capacity ³

NOTE: When specifications require test for only 1 out of each lot of 200 or less cylinders, the check on the others must be indicated by a notation hereon reading, "Each cylinder was subjected to a pressure of pounds per square inch and showed no defect."

¹ If the tests are made by a method involving the measurement of the amount of liquid forced into the cylinder by the test pressure, then the basic data, on which the calculations are made, such as the pump factors, temperature of liquid, coefficient of compressibility of liquid, etc., must also be given.

² Do not include removable cap but state whether with or without valve. These weights must be accurate to a tolerance of 1 percent.

³ Report approximate maximum and minimum volumetric capacity for the lot.

(Signed)

§ 178.53 [Reserved]

§ 178.53-1 thru 178.53-20 [Reserved]

§ 178.54 Specification 4B240-FLW; welded or welded and brazed cylinders with fusion-welded longitudinal seam.

§ 178.54-1 Compliance.

(a) Required in all details.

§ 178.54-2 Type, size, and service pressure.

(a) *Type and size.* Must be welded or brazed type with longitudinal fusion-welded seam. 240 pounds nominal water capacity. Cylinders closed in by spinning process not authorized.

(b) *Service pressure.*¹ 240 pounds per square inch.

§ 178.54-3 Inspection by whom and where.

Inspections and verifications must be performed by an independent inspection agency. Chemical analyses and tests as specified must be made within the United States.

§ 178.54-4 Duties of inspector.

(a) Inspect all material and reject any not complying with requirements.

¹ The "service pressure" limits the use of the cylinder. It is shown by marks on cylinder; for example, DOT-4B240-FLW.

(b) Verify chemical analysis of each heat of material by analysis or by obtaining certified analysis: *Provided*, That a certificate from the manufacturer thereof, giving sufficient data to indicate compliance with requirements, is acceptable when verified by check analyses of samples taken from one cylinder out of each lot of 200 or less.

(c) Verify compliance of cylinders with all requirements including markings; inspect inside before closing in both ends; verify heat treatment as proper; obtain samples for all tests and check chemical analyses; witness all tests; verify threads by gauge; report volumetric capacity and tare weight (see report form) and minimum thickness of wall noted.

(d) Render complete report (§ 178.54-22) to purchaser and cylinder maker.

§ 178.54-5 Steel.

(a) Steel shall be plain carbon steel of American Society for Testing Materials firebox quality with carbon content not in excess of 0.25 percent.

§ 178.54-6 Identification of material.

(a) Required; any suitable method.

§ 178.54-7 Defects.

(a) Material with seams, cracks, laminations, or other injurious defects, not authorized.

§ 178.54-8 Manufacture.

(a) By best appliances and methods; dirt and scale to be removed as neces-

sary to afford proper inspection; no defect acceptable that is likely to weaken the finished cylinder appreciably; reasonably smooth and uniform surface finish required. Exposed bottom welds on cylinders over 18" long must be protected by footings. Seams must be made as follows:

(1) Circumferential seams by welding or by brazing: Heads attached by brazing must have a driving fit with the shell, unless the shell is crimped, swedged, or curled over the skirt or flange of the head, and be thoroughly brazed until complete penetration by the brazing material of the brazed joint is secured. Depth of brazing from end of shell must be at least four times the thickness of shell metal.

(2) Longitudinal fusion-welded seam shall be of the double-welded butt type. Filler metal may be added from one side when and if means are provided for accomplishing complete penetration and reinforcement on both sides of the joint. For welding the cylinder, procedure and operators must be qualified in accordance with the sections of CGA Pamphlet C-3 that apply.

§ 178.54-9 Welding or brazing.

(a) The attachment to the tops and bottoms only of cylinders by welding or brazing of neckrings, footrings, handles, bosses, pads, and valve protection rings is authorized provided that such attachments and the portion of the container to which they are attached are made of weldable steel, the carbon content of which must not exceed 0.25 percent.

§ 178.54-10 Wall thickness.

(a) For outside diameters over 5 inches the minimum wall thickness shall be 0.090 inch. In any case the minimum wall thickness shall be such that calculated wall stress at 480 pounds per square inch shall not exceed 18,000 pounds per square inch.

(b) Calculation must be made by the formula:

$$S = \frac{P(1.3D^2 + 0.4d^2)}{D^2 - d^2}$$

where

S = wall stress in pounds per square inch;

P = 480 pounds per square inch;

D = outside diameter in inches;

d = inside diameter in inches.

§ 178.54-11 Heat treatment.

(a) Each cylinder shall be thermally stress-relieved after all initial welding and seam repair welding operations have been completed and prior to the hydrostatic test.

§ 178.54-12 Openings in cylinders.

(a) Each opening in cylinders, except those for safety devices, must be provided with a fitting, boss, or pad, securely attached to cylinder by brazing or by welding or by threads. Fitting, boss, or pad must be of steel suitable for the method of attachment employed, and which need not be identified or verified as to analysis, except that if attachment is by welding, carbon content must not exceed 0.25 percent. If threads are used they must comply with the following:

(1) Threads must be clean cut, even, without checks, and tapped to gauge.

(2) Taper threads to be of length not less than as specified for American Standard taper pipe threads.

(3) Straight threads, having at least 4 engaged threads, to have tight fit and calculated shear strength at least 10 times the test pressure of the cylinder; gaskets required, adequate to prevent leakage.

(b) Closure of fitting, boss, or pad must be adequate to prevent leakage.

§ 178.54-13 Safety devices and protection for valves, safety devices, and other connections, if applied.

(a) Must be as required by the Department's regulations that apply (see §§ 173.34(d) and 173.301(g) of this chapter).

§ 178.54-14 Hydrostatic test.

(a) By water-jacket, or other suitable method, operated so as to obtain accurate date. Pressure gauge must permit reading to accuracy of 1 percent. Expansion gauge must permit reading of total expansion to accuracy either of 1 percent or 0.1 cubic centimeter.

(b) Pressure must be maintained for 30 seconds and sufficiently longer to insure complete expansion. Any internal pressure applied after heat-treatment and previous to the official test must not exceed 90 percent of the test pressure. If, due to failure of the test apparatus, the test pressure cannot be

maintained, the test may be repeated at a pressure increased by 10 percent or 100 pounds per square inch whichever is the lower.

(c) Permanent volumetric expansion must not exceed 10 percent of total volumetric expansion at test pressure.

(d) Each cylinder shall be subjected to the hydrostatic test and test pressure shall be at least two and two thirds times the service pressure. Following this test, each cylinder shall be subjected to a dry air-pressure test of two times the service pressure. The cylinder shall be thoroughly dry before air test is applied, and during test welded seams shall be examined for leaks, either by submerging the cylinders in liquid, or by painting all welded seams with a solution suitable for the detection of leaks.

(e) One finished cylinder out of each lot, which appears to the inspector to be the least likely to meet the test, shall be selected by the inspector from each lot of 200 or less successively produced and shall be hydrostatically tested to destruction and shall not burst at a pressure less than six times the service pressure.

§ 178.54-15 Physical test.

(a) To determine yield strength, tensile strength, elongation, and reduction of area of material. Required on 2 specimens cut from 1¹/₂ inch cylinder, or part thereof heat-treated as required, taken at random out of each lot of 200 or less.

(b) Specimens must be: Gauge length 8 inches with width not over 1¹/₂ inches; or, gauge length 2 inches with width not over 1¹/₂ inches; provided, that gauge length at least 24 times thickness with width not over 6 times thickness is authorized when cylinder wall is not over ³/₁₆ inch thick. The specimen, exclusive of grip ends, must not be flattened. Grip ends may be flattened to within one inch of each end of the reduced section. When size of cylinder does not permit securing straight specimens, the specimens may be taken in any location or direction and may be straightened or flattened cold, by pressure only, not by blows; when specimens are so taken and prepared, the inspector's report must show in connection with record of phys-

ical tests detailed information in regard to such specimens. Heating of specimen for any purpose is not authorized.

(c) The yield strength in tension shall be the stress corresponding to a permanent strain of 0.2 percent of the gauge length.

(1) The yield strength shall be determined by either the "offset" method or the "extension under load" method as prescribed in ASTM Standard E8-57T.

(2) In using the "extension under load" method, the total strain (or "extension under load") corresponding to the stress at which the 0.2 percent permanent strain occurs may be determined with sufficient accuracy by calculating the elastic extension of the gauge length under appropriate load and adding thereto 0.2 percent of the gauge length. Elastic extension calculations shall be based on an elastic modulus of 30,000,000. In the event of controversy, the entire stress-strain diagram shall be plotted and the yield strength determined from the 0.2 percent offset.

(3) For the purpose of strain measurement, the initial strain shall be set while the specimen is under a stress of 12,000 pounds per square inch, the strain indicator reading being set at the calculated corresponding strain.

(4) Cross-head speed of the testing machine shall not exceed ¹/₈ inch per minute during yield strength determination.

§ 178.54-16 Acceptable results for physical tests.

(a) Elongation at least 40 percent for 2 inch gauge length or at least 20 percent in other cases; yield strength not over 73 percent of tensile strength; flattening test not required.

§ 178.54-17 Weld tests.

(a) *Guided bend test.* A "root" bend test specimen shall be cut from the cylinder or welded test plate, used for the tensile test specified in § 178.54-15 (a). Specimens must be taken across the major seam and must be prepared and tested in accordance with and must meet the requirements of CGA Pamphlet C-3.

(b) In addition to the guided bend test, a reduced section tension test shall be made transverse to the weld. The tensile strength shall be not less than 100 percent of the minimum of the specified tensile range of the base material used. Should this specimen fail to meet

¹ For lots of 30 or less, physical tests are authorized to be made on a ring at least 8 inches long cut from each cylinder and subjected to same heat treatment as the finished cylinder.

the requirements two additional specimens from the same cylinder shall be tested and if either of these fail to meet the requirements, the entire lot represented shall be rejected.

§ 178.54-18 Radiographic examination.

(a) The techniques and acceptability of radiographic inspection must conform to the standards set forth in CGA Pamphlet C-3.

(b) Cylinders must be examined as follows:

(1) One finished longitudinal seam shall be selected at random from each lot of 100 or less successively produced and be radiographed throughout its entire length. Should the radiographic examination fail to meet the requirements of paragraph (a) of this section, two additional seams of the same lot shall be examined, and if either of these fail to meet the requirements, each cylinder may be examined as outlined above; only those passing are acceptable.

§ 178.54-19 Rejected cylinders.

(a) Reheat treatment authorized; subsequent thereto acceptable cylinders must pass all prescribed tests. Repair of brazed seams by brazing and welded seams by welding is authorized.

§ 178.54-20 Marking.

(a) Marking required on each cylinder by stamping plainly and permanently on shoulder, top head, or neck as follows:

(1) DOT-4B240-FLW.

(2) A serial number and an identifying symbol (letters); location¹ of number to be just below or immediately following the DOT mark; location¹ of symbol to be just below or immediately following the

number. The symbol and numbers must be those of person making DOT mark. The symbol must be registered with the Bureau of Explosives; duplications unauthorized.

Examples:

DOT-4B240-FLW
1234
XY
DOT-4B240-FLW-1234-XY

(3) Inspector's official mark near serial number, date of test (such as 12-50 for December 1950), so placed that dates of subsequent test can be easily added.

§ 178.54-21 Size of marks.

(a) At least $\frac{1}{4}$ " high if space permits.

§ 178.54-22 Inspector's report.

(a) Required to be clear, legible, and in following form:

(Place) _____
(Date) _____

Gas cylinders

Manufactured for _____ Company
Location at _____
Manufactured by _____ Company
Location at _____
Consigned to _____ Company
Location at _____
Quantity _____
Size _____ inches outside diameter by _____ inch long.
Marks stamped into the shoulder of the cylinder are:
Specification DOT- _____
Serial numbers _____ to _____ inclusive
Inspector's mark _____
Identifying symbol (registered) _____
Test date _____
Tare weights (yes or no) _____
Other marks (if any) _____
These cylinders were made by process of _____

_____ The _____ permitted
(neckrings, footrings, etc.)
in § 178.54-9 were attached by process of _____

_____ (welding—brazing)
This material was identified by the following _____ numbers
(heat-purchase order)

_____ The material used was verified as to chemical analysis and record thereof is _____

¹ Symbol in front of or following the number with ample space between or symbol and serial number stamped into welded or brazed-on valve spud directly above the DOT specification mark located on head of cylinder are also authorized. Other variations in location authorized only when necessitated by lack of space. (NOTE: Footnote 1 applies only to § 178.54-20. The Footnote 1 referenced in § 178.55-20 remains unchanged.)

attached hereto. The heat numbers -----
----- marked on the material.
(were—were not)

All material, such as plates, billets and seamless tubing, was inspected and each cylinder was inspected both before and after closing in the ends; all that was accepted was found free from seams, cracks, laminations, and other defects which might prove injurious to the strength of the cylinder. The processes of manufacture and heat treatment of cylinders were supervised and found to be efficient and satisfactory.

The cylinder walls were measured and the minimum thickness noted was ----- inch. The outside diameter was determined by a close approximation to be ----- inches. The wall stress was calculated to be ----- pounds

per square inch under an internal pressure of ----- pounds per square inch.

Hydrostatic tests, tensile tests of material, and other tests, as prescribed in specification No. DOT-4B240FLW were made in the presence of the inspector and all material and cylinders accepted were found to be in compliance with the requirements of that specification. Records thereof are attached hereto.

I hereby certify that all of these cylinders proved satisfactory in every way and comply with the requirements of Department of Transportation specification No. 4B240FLW except as follows:

Exceptions: -----

(Signed) -----

Inspector.

(Place) -----

(Date) -----

RECORD OF CHEMICAL ANALYSIS OF MATERIAL FOR CYLINDERS

Numbered ----- to ----- inclusive.
Size ----- inches outside diameter by ----- inches long
Made by ----- Company
For ----- Company

NOTE: Any omission of analyses by heats, if authorized, must be accounted for by notation hereon reading "The prescribed certificate of the manufacturer of material has been secured, found satisfactory, and placed on file," or by attaching a copy of the certificate.

Test No.	Heat No.	Check analysis No.	Cylinders represented (serial Nos.)	Chemical analysis						
				C	P	S	Si	Mn	Ni	Cr
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

The analyses were made by -----

(Signed) -----

(Place) -----

(Date) -----

RECORD OF PHYSICAL TESTS OF MATERIAL FOR CYLINDERS

Numbered ----- to ----- inclusive.
Size ----- inches outside diameter by ----- inches long
Made by ----- Company
For ----- Company

Test No.	Cylinders represented by test (serial Nos.)	Yield strength (pounds per square inch)	Tensile strength (pounds per square inch)	Elongation (percent in 8 inches)	Reduction of area (percent)
-----	-----	-----	-----	-----	-----
-----	-----	-----	-----	-----	-----
-----	-----	-----	-----	-----	-----
-----	-----	-----	-----	-----	-----
-----	-----	-----	-----	-----	-----

(Signed) -----

(Place)
(Date)

RECORD OF WELD AND BURST TESTS

Numbered to inclusive.
Size inches outside diameter by inches long
Made by Company
For Company

Test No.	Cylinders represented by test (serial Nos.)	Root bend test acceptable (yes or no)	Transverse test acceptable (yes or no)	Radiographic examination acceptable (yes or no)	Burst test (pounds per square inch)

Radiographic technique employed consisted of
(Signed)

(Place)
(Date)

RECORD OF HYDROSTATIC TESTS ON CYLINDERS

Numbered to inclusive.
Size inches outside diameter by inches long
Made by Company
For Company

Serial numbers of cylinders tested arranged numerically	Actual test pressure (pounds per square inch)	Total expansion (cubic centimeters) ¹	Permanent expansion (cubic centimeters) ¹	Percent ratio of permanent expansion to total expansion ¹	Tare weight (pounds) ²	Volumetric capacity ³

¹ If the tests are made by a method involving the measurement of the amount of liquid forced into the cylinder by the test pressure, then the basic data, on which the calculations are made, such as the pump factors, temperature of liquid, coefficient of compressibility of liquid, etc., must also be given.

² Do not include removable cap but state whether with or without valve. These weights must be accurate to a tolerance of 1 percent.

³ Report approximate maximum and minimum volumetric capacity for the lot.

(Signed)

§ 178.55 Specification 4B240ET; welded and brazed cylinders made from electric resistance welded tubing.

(d) *Service pressure.*¹ Must be 240 pounds per square inch.

§ 178.55-1 Compliance.

(a) Required in all details.

§ 178.55-2 Type, spinning process, size and service pressure.

§ 178.55-3 Inspection by whom and where.

(a) *Type.* Cylinders must be of brazed type made from electric resistance welded tubing.

(b) *Spinning process.* Cylinders closed in by spinning process authorized.

(c) *Size.* The maximum water capacity of this type shall not exceed 12 pounds or 333 cubic inches. The maximum outside diameter of the shell shall be five inches and maximum length of shell 21 inches.

Inspections and verifications must be performed by an independent inspection agency or, in the case of cylinders manufactured in the United States, a compe-

¹ The "service pressure" limits the use of the cylinder. It is shown by marks on cylinder; for example, DOT-4B240ET indicates the service pressure as 240 pounds per square inch.

tent inspector of the manufacturer. Chemical analyses and tests as specified must be made within the United States.

§ 178.55-4 Duties of inspector.

The inspector shall:

(a) Inspect all material and reject any not meeting the requirements.

(b) Verify chemical analysis of each heat of material by analysis or by obtaining certified analysis: *Provided*, That a certificate from the manufacturer thereof, giving sufficient data to indicate compliance with requirements, is acceptable when verified by check analyses of samples taken from one cylinder out of each lot of 200 or less.

(c) Verify compliance of cylinders with all requirements including markings; inspect inside before closing in both ends; verify heat treatment as proper; obtain samples for all tests and check chemical analyses; witness all tests; verify threads by gauge; report volumetric capacity and tare weight (see report form) and minimum thickness of wall noted.

(d) Render complete report (§ 178.55-22) to purchaser and cylinder maker.

§ 178.55-5 Steel.

(a) Open-hearth, basic oxygen, or electric steel of uniform quality. Plain carbon steel content percent for the following not over: Carbon, 0.25; phosphorus, 0.045; sulfur, 0.050. The addition of other elements for alloying effect is prohibited.

§ 178.55-6 Identification of material.

(a) Required; any suitable method.

§ 178.55-7 Defects.

(a) Material with seams, cracks, laminations, or other injurious defects, not authorized.

§ 178.55-8 Manufacture.

(a) By best appliances and methods; dirt and scale to be removed as necessary to afford proper inspection; no defect

acceptable that is likely to weaken the finished cylinder appreciably; reasonably smooth and uniform surface finish required. Heads may be attached to shells by lap brazing or may be formed integrally. The thickness of the bottom of cylinders welded or formed by spinning is, under no condition, to be less than two times the minimum wall thickness of the cylindrical shell; such bottom thicknesses to be measured within an area bounded by a line representing the points of contact between the cylinder and floor when the cylinder is in a vertical position. Seams must be made as follows:

(b) Circumferential seams: By brazing only. Heads attached to shells by the lap brazing method shall overlap not less than four times wall thickness. Brazing material shall have a melting point of not less than 1000° F. Heads must have a driving fit with the shell unless the shell is crimped, swedged, or curled over the skirt or flange of the head and be thoroughly brazed until complete penetration of the joint by the brazing material is secured. Braze joints may be repaired by brazing.

(c) Longitudinal seams in shell: Electric resistance welded joints only. No repairs to longitudinal joints permitted.

§ 178.55-9 Welding or brazing.

(a) The attachment to the tops and bottoms only of cylinders by welding or brazing of neckrings, footrings, handles, bosses, pads, and valve protection rings is authorized provided that such attachments and the portion of the container to which they are attached are made of weldable steel, the carbon content of which must not exceed 0.25 percent.

§ 178.55-10 Wall thickness.

(a) The wall stress at two times service pressure shall not exceed 18,000 pounds per square inch. Minimum thickness shall be 0.044 inch.

(b) Calculation must be made by the formula:

$$S = \frac{P(1.3D^2 + 0.4d^2)}{D^2 - d^2}$$

where

S = wall stress in pounds per square inch;

P = 2 times service pressure;

D = outside diameter in inches;

d = inside diameter in inches.

§ 178.55-11 Heat treatment.

(a) Heads formed by drawing or pressing must be uniformly and properly heat treated prior to tests.

(b) Cylinders with integral formed heads or bases must be subjected to a normalizing operation. Normalizing and brazing operations may be combined, provided the operation is carried out at a temperature in excess of the upper critical temperature of the steel.

§ 178.55-12 Openings in cylinders.

(a) Each opening in cylinders, except those for safety devices, must be provided with a fitting, boss, or pad, securely attached to cylinder by brazing or by welding or by threads. Fitting, boss, or pad must be of steel suitable for the method of attachment employed, and which need not be identified or verified as to analysis, except that if attachment is by welding, carbon content must not exceed 0.25 percent. If threads are used, they must comply with the following:

(1) Threads must be clean cut, even without checks, and tapped to gauge.

(2) Taper threads to be of length not less than as specified for American Standard taper pipe threads.

(3) Straight threads, having at least 4 engaged threads, to have tight fit and calculated shear strength at least 10 times the test pressure of the cylinder; gaskets required, adequate to prevent leakage.

(b) Closure of fitting, boss, or pad must be adequate to prevent leakage.

§ 178.55-13 Safety devices and protection for valves, safety devices, and other connections, if applied.

(a) Must be as required by the Department's regulations that apply (see §§ 173.34(d) and 173.301 (g) of this chapter).

§ 178.55-14 Hydrostatic test.

(a) By water-jacket, or other suitable method, operated so as to obtain accurate data. Pressure gauge must permit reading to accuracy of 1 percent. Expansion gauge must permit reading of total expansion to accuracy either of 1 percent or 0.1 cubic centimeter.

(b) Pressure must be maintained for 30 seconds and sufficiently longer to insure complete expansion. Any internal pressure applied after heat-treatment and previous to the official test must not

exceed 90 percent of the test pressure. If, due to failure of the test apparatus, the test pressure cannot be maintained, the test may be repeated at a pressure increased by 10 percent or 100 pounds per square inch, whichever is the lower.

(c) Permanent volumetric expansion must not exceed 10 percent of total volumetric expansion at test pressure.

(d) Cylinders must be tested as follows:

(1) At least one cylinder selected at random out of each lot of 200 or less shall be tested as outlined in paragraphs (a), (b), and (c) of this section to at least two times service pressure.

(2) All cylinders not tested as outlined in subparagraph (1) of this paragraph must be examined under pressure of at least two times service pressure and show no defect.

(e) Each 1000 cylinders or less successively produced each day shall constitute a lot. One cylinder shall be selected from each lot and hydrostatically tested to destruction. If this cylinder bursts below five times the service pressure, then two additional cylinders must be selected and subjected to this test. If either of these cylinders fails by bursting below five times the service pressure then the entire lot must be rejected. All cylinders constituting a lot shall be of identical size, construction heat-treatment, finish, and quality.

§ 178.55-15 Flattening test.

(a) Between knife edges, wedge shaped, 60° angle, rounded to 1/2" radius; test 1 cylinder taken at random out of each lot of 200 or less, after hydrostatic test.

§ 178.55-16 Physical test.

(a) To determine yield strength, tensile strength, elongation, and reduction of area of material. Required on 2 specimens cut from 1 cylinder, or part thereof heat-treated as required, taken at random out of each lot of 200 or less in the case of cylinders of capacity greater than 86 cubic inches and out of each lot of 500 or less for cylinders having a capacity of 86 cubic inches or less.

(b) Specimens must be: Gauge length 8 inches with width not over 1 1/2 inches; or, gauge length 2 inches with width not

over 1½ inches; provided, that gauge length at least 24 times thickness with width not over 6 times thickness is authorized when cylinder wall is not over ⅜ inch thick. The specimen, exclusive of grip ends, must not be flattened. Grip ends may be flattened to within one inch of each end of the reduced section. When size of cylinder does not permit securing straight specimens, the specimens may be taken in any location or direction and may be straightened or flattened cold by pressure only, not by blows; when specimens are so taken and prepared, the inspector's report must show in connection with record of physical tests detailed information in regard to such specimens. Heating of specimen for any purpose is not authorized.

(c) The yield strength in tension shall be the stress corresponding to a permanent strain of 0.2 percent of the gauge length.

(1) The yield strength shall be determined by either the "offset" method or the "extension under load" method as prescribed in ASTM Standard E8-57T.

(2) In using the "extension under load" method, the total strain (or, "extension under load") corresponding to the stress at which the 0.2 percent permanent strain occurs may be determined with sufficient accuracy by calculating the elastic extension of the gauge length under appropriate load and adding thereto 0.2 percent of the gauge length. Elastic extension calculations shall be based on an elastic modulus of 30,000,000. In the event of controversy, the entire stress-strain diagram shall be plotted and the yield strength determined from the 0.2 percent offset.

(3) For the purpose of strain measurement, the initial strain shall be set while the specimen is under a stress of 12,000 pounds per square inch, the strain indicator reading being set at the calculated corresponding strain.

(4) Cross-head speed of the testing machine shall not exceed ⅛ inch per minute during yield strength determination.

§ 178.55-17 Acceptable results for physical and flattening tests.

(a) Elongation at least 40 percent for 2 inch gauge length or at least 20 percent

in other cases; yield strength not over 73 percent of tensile strength; flattening test required, without cracking, to six times wall thickness with weld 90° from direction of applied load. Two rings cut from the ends of length of pipe used in production of a lot may be used for flattening test provided the rings accompany the lot which they represent in all thermal processing operations. At least one of the rings must pass the flattening test.

§ 178.55-18 Leakage test.

(a) All spun cylinders and plugged cylinders (see Notes 1 and 2) must be tested for leakage by gas or air pressure after the bottom has been cleaned and is free from all moisture. Pressure, approximately the same as but no less than service pressure, must be applied to one side of the finished bottom over an area of at least ⅛ of the total area of the bottom but not less than ¾" in diameter, including the closure, for at least 1 minute, during which time the other side of the bottom exposed to pressure must be covered with water and closely examined for indications of leakage. Leakers must be rejected. See § 178.55-19(a)(1.).

NOTE 1: A spun cylinder is one in which an end closure in the finished cylinder has been welded by the spinning process.

NOTE 2: A plugged cylinder is one in which a permanent closure in the bottom of a finished cylinder has been effected by a plug.

NOTE 3: As a safety precaution, if the manufacturer elects to make this test before the hydrostatic test, he should design his apparatus so that the pressure is applied to the smallest area practicable, around the point of closure, and so as to use the smallest possible volume of air or gas.

§ 178.55-19 Rejected cylinders.

(a) *Repairs authorized.* Leakers must be rejected, except that:

(1) Spun cylinders rejected under the provisions of § 178.55-18 may be removed from the spun cylinder category by drilling to remove defective material, tapping, and plugging.

(2) Brazed joints may be rebrazed.

(3) Subsequent to the operations noted above in subparagraphs (1) and (2) of this paragraph, acceptable cylinders must pass all prescribed tests.

§ 178.55-20 Marking.

(a) Marking on each cylinder by stamping plainly and permanently on shoulder, top head, neck or valve protection collar which is permanently attached to the cylinders and forming an integral part thereof, provided that cylinders not less and 0.090 inch thick may be stamped on the side wall adjacent to top head, as follows:

(1) DOT-4B240ET.

(2) A serial¹ number and an identifying symbol (letters); location² of number to be just below or immediately following the DOT mark; location² of symbol to be just below or immediately following the number. The symbol and numbers must be those of person making DOT mark. The symbol must be registered with the Bureau of Explosives; duplications unauthorized.

Examples:

DOT-4B240ET

1234

XY

DOT-4B240ET-1234-XY

(3) Inspector's official mark, near serial number; date of test (such as 5-50 for May 1950), so placed that date of subsequent test can be easily added; and word "SPUN" or "PLUG" near DOT mark when an end closure in the finished cylinder has been welded by the spinning process or effected by plugging.

§ 178.55-21 Size of marks.

(a) At least $\frac{1}{4}$ " high if space permits.

¹ Lot numbers, not over 500 cylinders in each lot, authorized for cylinders not over 2 inches outside diameter and for cylinders over 2 inches outside diameter when the volumetric capacity does not exceed 170 cubic inches.

² Symbol in front of or following the number with ample space between or symbol and serial number stamped into welded or brazed-on valve spud directly above the DOT specification mark located on head of cylinder are also authorized. Other variations in location authorized only when necessitated by lack of space.

§ 178.55-22 Inspector's report.

(a) Required to be clear, legible, and in following form:

(Place) -----

(Date) -----

Gas cylinders

Manufactured for ----- Company

Location at -----

Manufactured by ----- Company

Location at -----

Consigned to ----- Company

Location at -----

Quantity -----

Size ----- inches outside diameter by ----- inches long.

Marks stamped into the shoulder of the cylinder are:

Specification DOT-----

Serial numbers ----- to ----- inclusive

Inspector's mark -----

Identifying symbol (registered) -----

Test date -----

Tare weights (yes or no) -----

Other marks (if any) -----

These cylinders were made by process of -----

The ----- permitted in

(neckrings, footrings, etc.)

§ 178.55-9 were attached by process of -----

(welding—brazing)

The material used was identified by the following ----- numbers -----

(heat-purchase order)

The material used was verified as to chemical analysis and record thereof is attached hereto. The heat numbers -----

(were—were not)

marked on the material.

All material such as plates, billets and electric resistance welded tubing, was inspected and each cylinder was inspected both before and after closing in the ends; all that was accepted was found free from seams, cracks, laminations, and other defects which might prove injurious to the strength of the cylinder. The processes of manufacture and heat treatment of cylinders were supervised and found to be efficient and satisfactory.

The cylinder walls were measured and the minimum thickness noted was ----- inch. The outside diameter was determined by a close approximation to be ----- inches. The wall stress was calculated to be ----- pounds per square inch under an internal pressure of ----- pounds per square inch.

Hydrostatic tests, flattening tests, tensile tests of material, and other tests, as pre-

scribed in specification No. DOT-4B-ET were made in the presence of the inspector and all material and cylinders accepted were found to be in compliance with the requirements of that specification. Records thereof are attached hereto.

A certificate of test on the electric resistance tubing has been obtained from the tubing manufacturer. Records thereof are attached hereto.

I hereby certify that all of these cylinders proved satisfactory in every way and comply with the requirements of Department of Transportation specification No. DOT-4B-ET except as follows:

Exceptions

(Signed)

Inspector.

(Place).....
(Date).....

RECORD OF PHYSICAL TESTS OF MATERIAL FOR CYLINDERS

Numbered to inclusive
Size inches outside diameter by inches long
Made by Company
For Company

Test No.	Cylinders represented by test (serial Nos.)	Yield strength (pounds per square inch)	Tensile strength (pounds per square inch)	Elongation (percent in 8 inches)	Reduction of area (percent)	Flattening test	Bursting test (pounds per square inch)
.....
.....
.....
.....

(Signed)

(Place).....
(Date).....

RECORD OF CHEMICAL ANALYSIS OF MATERIAL FOR CYLINDERS

Numbered to inclusive.
Size inches outside diameter by inches long
Made by Company
For Company

NOTE: Any omission of analyses by heats, if authorized, must be accounted for by notation hereon reading "The prescribed certificate of the manufacturer of material has been secured, found satisfactory, and placed on file," or by attaching a copy of the certificate.

Test No.	Heat No.	Check analysis	Cylinders represented (serial Nos.)	Chemical analysis						
				C	P	S	Si	Mn	Ni	Cr
.....
.....
.....
.....

The analyses were made by

(Signed)

§ 178.56-7 Defects.

(a) Material with seams, cracks, laminations, or other injurious defects, not authorized.

§ 178.56-8 Manufacture.

(a) By best appliances and methods: dirt and scale to be removed as necessary to afford proper inspection; no defect acceptable that is likely to weaken the finished cylinder appreciably; reasonably smooth and uniform surface finish required. Exposed bottom welds on cylinders over 18 inches long must be protected by footings. Minimum thickness of heads and bottoms shall be not less than 90 percent of the required thickness of the side wall. Seams must be made as follows:

(b) Circumferential seams: By welding. Brazing is not authorized.

(c) Longitudinal seams: Not permitted.

§ 178.56-9 Welding.

(a) The attachment to the tops and bottoms only of cylinders by welding of neckrings, footings, bosses, pads, and valve protection rings is authorized provided that such attachments are made of weldable steel, the carbon content of which does not exceed 0.25 percent.

§ 178.56-10 Wall thickness.

(a) For outside diameters over 5 inches the minimum wall thickness shall be 0.078 inch. In any case the minimum wall thickness shall be such that the calculated wall stress at minimum test pressure in § 178.56-14) shall not exceed the lesser value of either of the following:

(1) One-half of the minimum tensile strength of the material determined as required in § 178.56-15, or,

(2) 35,000 pounds per square inch.

(b) Calculation must be made by the formula:

$$S = \frac{P(1.3D^2 + 0.4d^2)}{D^2 - d^2}$$

where

S=wall stress in pounds per square inch;

P=minimum test pressure prescribed for water jacket test;

D=outside diameter in inches;

d=inside diameter in inches.

(c) Cylinders with wall thickness less than 0.100 inch, the ratio of tangential length to outside diameter shall not exceed 4.0.

§ 178.56-11 Heat treatment.

(a) Each cylinder must be uniformly and properly heat treated prior to test. Any suitable heat treatment in excess of 1100° F., is authorized except that liquid quenching is not permitted. Heat treatment must be accomplished after all forming and welding operations.

(b) Heat treatment is not required after welding weldable low carbon parts to attachments of similar material which have been previously welded to the top or bottom of cylinders and properly heat treated, provided such subsequent welding does not produce a temperature in excess of 400° F., in any part of the top or bottom material.

§ 178.56-12 Openings in cylinders.

(a) All openings must be in the heads or bases.

(b) Each opening in cylinders, except those for safety devices, must be provided with a fitting boss, or pad, securely attached to cylinder by welding or by threads. If threads are used they must comply with the following:

(1) Threads must be clean-cut, even without checks and cut to gauge.

(2) Taper threads to be of length not less than as specified for American Standard taper pipe threads.

(3) Straight threads having at least 6 engaged threads, to have tight fit and calculated shear strength at least 10 times the test pressure of the cylinder; gaskets required, adequate to prevent leakage.

(c) Closure of fitting, boss or pad must be adequate to prevent leakage.

§ 178.56-13 Safety devices and protection for valves, safety devices, and other connections, if applied.

(a) Must be as required by the Department's regulations that apply (see §§ 173.34(d), 173.124(a), and 173.301(g) of this chapter).

§ 178.56-14 Hydrostatic test.

(a) By water jacket, or other suitable method, operated so as to obtain accurate data. Pressure gauge must permit reading to accuracy of 1 percent. Expansion gauge must permit reading of total expansion to accuracy of either 1 percent or 0.1 cubic centimeter.

(b) Pressure must be maintained for at least 30 seconds or sufficiently longer to assure complete expansion. Any internal pressure applied after heat-treatment and before the official test must not exceed 90 percent of the test pressure. If, due to failure of test apparatus, the test pressure cannot be maintained, the test may be repeated at a pressure increased by 10 percent or 100 pounds per square inch, whichever is lower.

(c) Permanent volumetric expansion must not exceed 10 percent of the total volumetric expansion at test pressure.

(d) Cylinders must be tested as follows:

(1) At least one cylinder selected at random out of each lot of 200 or less must be tested as described in paragraphs (a), (b), and (c) of this section, to at least two times service pressure. If a selected cylinder fails, then two additional specimens must be selected at random from the same lot and subjected to the prescribed test. If either of these fails the test, then each cylinder in that lot must be so tested; and

(2) Each cylinder not tested as prescribed in subparagraph (1) of this paragraph must be examined under pressure of at least two times service pressure and must show no defect. A cylinder showing a defect must be rejected unless it may be requalified under § 178.56-18(a).

§ 178.56-15 Physical test.

(a) To determine yield strength, tensile strength, elongation, and reduction of area of material. Required on 2 specimens cut from one cylinder having passed the hydrostatic test, or part thereof heat-treated as required, taken at random out of each lot of 200 or less.

(b) Specimens must be: Gauge length 8 inches with width not over $1\frac{1}{2}$ inches; or, gauge length 2 inches with width not over $1\frac{1}{2}$ inches, provided that gauge length at least 24 times thickness with width not over 6 times thickness is authorized when cylinder wall is not over $\frac{3}{16}$ inch thick. The specimen, exclusive of grip ends, must not be flattened. Grip ends may be flattened to within one

inch of each end of the reduced section. When size of cylinder does not permit securing straight specimens, the specimens may be taken in any location or direction and may be straightened or flattened cold, by pressure only, not by blows; when specimens are so taken and prepared, the inspector's report must show in connection with record of physical tests detailed information in regard to such specimens. Heating of specimen for any purpose is not authorized.

(c) The yield strength in tension shall be the stress corresponding to a permanent strain of 0.2 percent of the gauge length.

(1) The yield strength shall be determined by either the "offset" method or the "extension under load" method as prescribed in ASTM Standard E8-57T.

(2) In using the "extension under load" method, the total strain (or "extension under load"), corresponding to the stress at which the 0.2 percent permanent strain occurs may be determined with sufficient accuracy by calculating the elastic extension of the gauge length under appropriate load and adding thereto 0.2 percent of the gauge length. Elastic extension calculations shall be based on an elastic modulus of 30,000,000. In the event of controversy, the entire stress-strain diagram shall be plotted and the yield strength determined from the 0.2 percent offset.

(3) For the purpose of strain measurement, the initial strain reference shall be set while the specimen is under a stress of 12,000 pounds per square inch, the strain indicator reading being set at the calculated corresponding strain.

(4) Cross-head speed of the testing machine shall not exceed $\frac{1}{8}$ inch per minute during yield strength determination.

§ 178.56-16 Elongation.

(a) Physical test specimens must show at least 40 percent for 2-inch gauge length or at least 20 percent in other cases, except that these elongation percentages may be reduced numerically by 2 for 2-inch specimens and by 1 in other cases for each 7,500 pounds per square inch increment of tensile strength above 50,000 pounds per square inch to a maximum of four such increments.

§ 178.56-17 Tests of welds.

(a) *Tensile test.* A specimen shall be cut from one cylinder of each lot of 200 or less, or welded test plate.¹ The specimens must be taken across the major seam and must be prepared and tested in accordance with and must meet the requirements of CGA Pamphlet C-3. Should this specimen fail to meet the requirements, specimens may be taken from two additional cylinders or welded test plates from the same lot and tested. If either of the latter specimens fail to meet the requirements, the entire lot represented shall be rejected.

(b) *Guided bend test.* A "root" bend test specimen shall be cut from the cylinder or welded test plate, used for the tensile test specified in paragraph (a) of this section. Specimens must be taken across the major seam and must be prepared and tested in accordance with and must meet the requirements of CGA Pamphlet C-3.

(c) *Alternate guided-bend test.* This test may be used and must be as required by CGA Pamphlet C-3. The specimen shall be bent until the elongation at the outer surface, adjacent to the root of the weld, between the lightly scribed gage lines—a to b, shall be at least 20 percent, except that this percentage may be reduced for steels having a tensile strength in excess of 50,000 pounds per square inch, as provided in § 178.56-16(a).

§ 178.56-18 Rejected cylinders.

(a) Reheat treatment authorized; subsequent thereto, acceptable cylinders must pass all prescribed tests. Repair of welded seams by welding is authorized.

§ 178.56-19 Marking.

(a) Marking on each cylinder stamped as follows:

¹ The welded test plate shall be of one of the heats in the lot of 200 or less which it represents, in the same condition and approximately the same thickness as the cylinder wall except that in no case shall it be of lesser thickness than that required for a one-quarter size Charpy impact specimen. The weld must be made by the same procedure and subjected to the same heat treatment as the major weld on the cylinder.

(1) DOT-4AA480.

(2) The serial number and identifying symbol of person making DOT mark. The symbol must be registered with the Bureau of Explosives. Duplications unauthorized.

(3) Inspector's official mark.

(4) Date of test (such as 1-54 for January 1954).

(5) Additional markings are permitted.

(b) Sequence of marks. Number shall be just below or immediately following the DOT mark; identifying symbol shall be just below or immediately following the number; inspector's official mark shall be near the serial number. Date of test shall be so placed that dates of subsequent tests can easily be added. Symbol in front of the number, with space between, or symbol and serial number stamped into welded valve spud directly above the DOT mark located on head of cylinder are also authorized. Other variations in sequence of marks authorized only when necessitated by lack of space.

(c) Location of markings. Markings may be stamped plainly and permanently in the following locations on the cylinder:

(1) On shoulders and top heads not less than 0.087 inch thick.

(2) On neck, valve boss, valve protection sleeve, or similar part permanently attached to top end of cylinder.

(3) On a plate attached to the top of the cylinder or permanent part thereof: sufficient space must be left on the plate to provide for stamping at least six retest dates: the plate must be at least $\frac{1}{16}$ inch thick and must be attached by welding or by brazing at a temperature of at least 1,100° F., throughout all edges of the plate.

(4) Variations in location of markings authorized only when necessitated by lack of space.

(d) Size of marks. Space permitting, at least $\frac{1}{4}$ inch high.

§ 178.56-20 Authorized steel.

(a) As specified in Table I of Appendix A to this part.

§ 178.56-21 Inspector's report.

(a) Required to be clear, legible and in following form:

(Place) -----
(Date) -----

Steel gas cylinders

Manufactured for -----
Location at -----
Manufactured by -----
Location at -----
Consigned to -----
Location at -----
Quantity ----- Size ----- inches outside
diameter by ----- inches long.
Marks stamped into the -----

(Location of marking)
of the cylinder are:
Specification DOT-----
Serial numbers ----- to ----- inclusive
Inspector's mark -----
Identifying symbol (registered) -----
Test date -----
Tare weights (yes or no) -----
Other marks -----
These cylinders were made by process of -----

The material used was type ----- au-
thorized in table I of Spec. No. 4AA480.

The material used was identified by the
following -----
(Heat-purchase order)

numbers -----
The material used was verified as to
chemical analysis and record thereof is at-
tached hereto. The heat numbers -----

(Were—were not)
marked on the material.

All material was inspected and all that
was accepted was found free from seams,
cracks, laminations and other injurious de-
fects.

The compliance of cylinders with speci-
fication requirements was verified including
markings, condition of inside, tests, threads,
etc. All cylinders with defects which might
prove injurious were rejected. The pro-
cesses of manufacture and heat treatment
were supervised and found to be efficient
and satisfactory.

The cylinder walls were measured and the
minimum thickness noted was ----- inch.
The outside diameter was determined by a
close approximation to be ----- inches.
The wall stress was calculated to be -----
pounds per square inch under an internal
pressure of ----- pounds per square inch.

Hydrostatic tests, tensile tests of material,
and other tests as prescribed in specification
DOT-4AA480 were made in the presence of
the inspector and all cylinders accepted were
found to be in compliance with the require-
ments of that specification. Records thereof
are attached hereto.

Each cylinder ----- been equipped
(Has—has not)
with safety devices as follows: -----

I hereby certify that all of these cylinders
proved satisfactory in every way and comply
with the requirements of Department of
Transportation specification No. 4AA480 ex-
cept as follows:

Exceptions -----
(Manufacturer's name)

Signed -----
(Inspector)

By -----

(Place) -----
(Date) -----

RECORD OF CHEMICAL ANALYSIS OF STEEL FOR CYLINDERS

Numbered ----- to ----- inclusive.
Size ----- inches outside diameter by ----- inches long
Made by ----- Company
For ----- Company

Test No.	Heat No.	Check analysis No.	Cylinders represented (serial Nos.)	Chemical analysis									
				C	P	S	Si	Mn	Ni	Cr	Mo	Cu	Al	Zr

Steel was manufactured by ----- Company. The originals of the certified mill
test reports are in the files of the manufacturer.

NOTE: Any omission of analyses by heats if authorized, must be accounted for by nota-
tion hereon reading "The prescribed certificate of the manufacturer of material has been
secured, found satisfactory, and placed on file," or by attaching a copy of the certificate.

Chemical analyses were made by -----

(Place) -----

(Date) -----

RECORD OF CHEMICAL ANALYSIS OF STEEL FOR CYLINDERS

Numbered ----- to ----- inclusive
 Size ----- inches outside diameter by ----- inches long
 Made by ----- Company
 For ----- Company

Test No.	Cylinders represented by test (serial Nos.)	Yield strength (pounds per square inch)	Tensile strength (pounds per square inch)	Elongation (percent in inches)	Reduction of area (percent)	Weld tensile test	Weld bend test
-----	-----	-----	-----	-----	-----	-----	-----
-----	-----	-----	-----	-----	-----	-----	-----
-----	-----	-----	-----	-----	-----	-----	-----
-----	-----	-----	-----	-----	-----	-----	-----

(Signed) -----

(Place) -----

(Date) -----

RECORD OF HYDROSTATIC TESTS ON CYLINDERS

Numbered ----- to ----- inclusive.
 Size ----- inches outside diameter by ----- inches long
 Made by ----- Company
 For ----- Company

Serial Nos. of cylinders tested arranged numerically	Actual test pressure (pounds per square inch)	Total expansion (cubic centimeters)	Permanent expansion (cubic centimeters) ¹	Percent ratio of permanent expansion to total expansion ¹	Tare weight (pounds) ²	Volumetric capacity ³
-----	-----	-----	-----	-----	-----	-----
-----	-----	-----	-----	-----	-----	-----
-----	-----	-----	-----	-----	-----	-----
-----	-----	-----	-----	-----	-----	-----

NOTE: When specifications require test for only 1 out of each lot of 200 or less cylinders, the check on the others must be indicated by a notation hereon reading, "Each cylinder was subjected to a pressure of ----- pounds per square inch and showed no defect."

¹ If the tests are made by a method involving the measurement of the amount of liquid forced into the cylinder by the test pressure, then the basic data, on which the calculations are made, such as the pump factors, temperature of liquid, coefficient of compressibility of liquid, etc., must also be given.

² Do not include removable cap but state whether with or without valve. These weights must be accurate to a tolerance of 1 percent.

³ Report approximate maximum and minimum volumetric capacity for the lot.

(Signed) -----

§ 178.57 Specification 4L; welded cylinders insulated.

§ 178.57-1 Compliance.

(a) Required in all details.

§ 178.57-2 Type, size, service pressure,¹ and service temperature.²(a) *Type and size.* Must be fusion welded; not over 1,000 pounds water

capacity (nominal). For liquefied hydrogen service, the cylinders must be designed to stand on end, with the axis of the cylindrical portion vertical.

(b) The service pressure shall be more than 40 and not over 500 pounds per square inch.

service pressure as 200 pounds per square inch.

¹ The service pressure limits the use of the cylinder. It is shown by marks on the cylinder; for example: DOT-4L200 indicates the

² The service temperature is the lowest temperature at which the cylinder may be used.

(c) The service temperature shall be minus 320° F. or colder. For liquefied hydrogen service, the service temperature shall be minus 423° F. or colder.

§ 178.57-3 Inspection by whom and where.

Inspections and verifications must be performed by an independent inspection agency or, in the case of cylinders manufactured in the United States, a competent inspector of the manufacturer. Chemical analyses and tests as specified must be made within the United States.

§ 178.57-4 Duties of inspector.

(a) Inspect all material and reject any not complying with requirements of this specification.

(b) Verify chemical analysis of each heat of material by analysis or by obtaining certified analysis: *Provided*, That a certificate from the manufacturer thereof, giving sufficient data to indicate compliance with requirements, is acceptable when verified by check analyses of samples taken from one cylinder out of each lot of 200 or less.

(c) Verify compliance with all specification requirements. Obtain samples for all tests. Obtain samples for check chemical analyses, where required. Witness all tests. Report volumetric capacity, tare weight (see report form), and minimum thickness of wall noted.

(d) Render complete report (§ 178.57-22) to purchaser and cylinder maker.

§ 178.57-5 Material.

(a) Designations and limiting chemical compositions of steel authorized by this specification shall be as shown in § 178.57-21(a), Table I.

§ 178.57-6 Identification of material.

(a) Required; by any suitable method.

§ 178.57-7 Defects.

(a) Material with seams, cracks, laminations, or other injurious defects, not authorized.

§ 178.57-8 Manufacture.

(a) By best appliances and methods; dirt and scale to be removed as necessary to afford proper inspection; no defect acceptable that is likely to weaken the finished cylinder appreciably; reasonably smooth and uniform surface finish required. The shell portion must be a reasonably true cylinder.

(b) The heads must be seamless, concave side to the pressure, hemispherical or ellipsoidal in shape with the major diameter not more than twice the minor diameter. Minimum thickness of heads shall be not less than 90 percent of the required thickness of the sidewall. The heads must be reasonably true to shape, shall have no abrupt shape changes and the skirts must be reasonably true to round.

(c) The surface of the cylinder must be insulated. The insulating material must be fire resistant. The insulation must be covered with a steel jacket of not less than 0.060-inch thickness so constructed that moisture cannot come in contact with the insulating material. The construction must be such that the total heat transfer from the atmosphere at ambient temperature to the contents of the cylinder shall not exceed 0.0005 B.t.u. per hour per Fahrenheit degree differential in temperature per pound of water capacity of the cylinder. For liquefied hydrogen service, the total heat transfer, with a temperature difference of 520 Fahrenheit degrees, must not exceed that required to vent 30 standard cubic feet of hydrogen gas per hour.

§ 178.57-9 Welding.

(a) All seams of the cylinder must be fusion welded. Means must be provided for accomplishing complete penetration of the joint. Only butt or joggle butt joints for the cylinder seams are authorized. All joints in the cylinder must be in reasonably true alignment.

(b) All attachments to the sidewalls and heads of the cylinder must be by fusion welding and must be of a weldable material complying with the impact requirements of § 178.57-17(d).

(c) For welding the cylinder, each procedure and operator must be qualified in accordance with the sections of CGA Pamphlet C-3 that apply. In addition, impact tests of the weld shall be

performed in accordance with § 178.57-17(d) as part of the qualification of each welding procedure and operator.

(d) Brazing, soldering and threading are permitted only for joints not made directly to the cylinder body. Threads must comply with § 178.57-12.

§ 178.57-10 Wall thickness.

(a) The minimum wall thickness of the cylinder shall be such that the calculated wall stress at minimum required test pressure shall not exceed the least value of the following:

- (1) 45,000 pounds per square inch.
- (2) One-half of the minimum tensile strength across the welded seam determined as required in § 178.57-17(a).
- (3) One-half of the minimum tensile strength of the base metal determined as required in § 178.57-15.
- (4) The yield strength of the base metal determined as required in § 178.57-15.
- (5) Further provided that wall for cylinders having longitudinal seams must not exceed 85 percent of the above value, whichever applies.

(b) Calculation must be made by the formula:

$$S = \frac{P(1.3D^2 + 0.4d^2)}{D^2 - d^2}$$

where:

- S = wall stress in pounds per square inch;
 P = minimum test pressure prescribed for hydrostatic test;
 D = outside diameter in inches;
 d = inside diameter in inches.

§ 178.57-11 Heat treatment.

Not permitted.

§ 178.57-12 Openings in cylinder.

(a) Openings permitted in heads only. They must be circular and shall not exceed 3 inches diameter or $\frac{1}{3}$ of the cylinder diameter, whichever is the smaller. Each opening in the cylinder must be provided with a fitting, boss or pad securely attached to the cylinder body by fusion welding. Attachments to a fitting, boss or pad may be made by welding, brazing, soldering or threading. Threads must comply with following:

- (1) Threads must be clean cut, even, without checks and cut to gauge.
- (2) Taper threads to be of length not less than as specified for American Standard taper pipe threads.

(3) Straight threads must have at least 4 engaged threads and have tight fit and calculated shear strength at least 10 times the test pressure of the cylinder gaskets required, inert to the commodity and adequate to prevent leakage.

§ 178.57-13 Safety devices and pressure control valves.

(a) Must be as required by the Department's regulations that apply §§ 173.34(d), and 173.304(b) (2) of this chapter.

§ 178.57-14 Pressure test.

(a) Each cylinder before insulating and jacketing must be examined under a pressure of at least 2 times the service pressure maintained for at least 30 seconds without evidence of leakage, visible distortion or other defect. Pressure gauge must permit reading to accuracy of 1 percent.

§ 178.57-15 Physical test.

(a) Determine yield strength, tensile strength, and elongation on 2 specimens selected from material of each heat and in the same condition as that in the completed cylinder.

(b) Specimens must be Gauge length 8 inches with width not over $1\frac{1}{2}$ inches; or, gauge length 2 inches with width not over $1\frac{1}{2}$ inches; or gauge length at least 24 times thickness with width not over 6 times thickness (authorized when cylinder wall is not over $\frac{3}{16}$ inch thick). The specimen, exclusive of grip ends, must not be flattened. Grip ends may be flattened to within one inch of each end of the reduced section. When size of cylinder does not permit securing straight specimens, the specimens may be taken in any location or direction and may be straightened or flattened cold by pressure only, not by blows; when specimens are so taken and prepared, the inspector's report must show in connection with record of physical tests detailed information in regard to such specimens. Heating of specimen for any purpose is not authorized.

(c) The yield strength in tension shall be the stress corresponding to a permanent strain of 0.2 percent of the gauge length.

(1) The yield strength shall be determined by either the "offset" method

or the "extension under load" method as prescribed in ASTM Standard E8-57T.

(2) In using the "extension under load" method, the total strain (or "extension under load"), corresponding to the stress at which the 0.2 percent permanent strain occurs may be determined with sufficient accuracy by calculating the elastic expansion of the gauge length under appropriate load and adding thereto 0.2 percent of the gauge length. Elastic extension calculations shall be based on the elastic modulus of the material used. In the event of controversy, the entire stress-strain diagram shall be plotted and the yield strength determined from the 0.2 percent offset.

(3) For the purpose of strain measurement, the initial strain reference shall be set while the specimen is under a stress of 12,000 pounds per square inch, the strain indicator reading being set at the calculated corresponding strain.

(4) Cross-head speed of the testing machine shall not exceed $\frac{1}{8}$ inch per minute during yield strength determination.

§ 178.57-16 Acceptable results for physical tests.

Physical properties must meet the limits specified in § 178.57-21(a), Table 1, for the particular steel in the annealed condition. The specimens must show at least 20 percent elongation for 2-inch gage length except that the percentage may be reduced numerically by 2 for each 7,500 pounds per square inch increment of tensile strength above 100,000 pounds per square inch to a maximum of 5 such increments. Yield strength and tensile strength must meet the requirements of § 178.57-21(a), Table 1.

§ 178.57-17 Tests of welds.

(a) *Tensile test.* A specimen shall be cut from one cylinder of each lot of 200 or less, or welded test plate.¹ The specimen must be taken across the major seam and must be prepared and tested in ac-

cordance with and must meet the requirements of CGA Pamphlet C-3. Should this specimen fail to meet the requirements, specimens may be taken from two additional cylinders or welded test plates from the same lot and tested. If either of the latter specimens fails to meet the requirements, the entire lot represented shall be rejected.

(b) *Guided bend test.* A "root" bend test specimen shall be cut from the cylinder or welded test plate, used for the tensile test specified in § 178.57-17(a) and from any other seam or equivalent welded test plate if the seam is welded by a procedure different from that used for the major seam. Specimens must be taken across the particular seam being tested and must be prepared and tested in accordance with and must meet the requirements of CGA Pamphlet C-3.

(c) *Alternate guided-bend test.* This test may be used and must be as required by CGA Pamphlet C-3. The specimen shall be bent until the elongation at the outer surface, adjacent to the root of the weld, between the lightly scribed gage lines—a to b, shall be at least 20 percent, except that this percentage may be reduced for steels having a tensile strength in excess of 100,000 pounds per square inch, as provided in § 178.57-16(a).

(d) *Impact tests.* One set of three impact test specimens (for each test) shall be prepared and tested for determining the impact properties of the deposited weld metal (1) as part of the qualification of the welding procedure, (2) as part of the qualification of the operators, (3) for each "heat" of welding rod or wire used, and (4) for each 1,000 feet of weld made with the same heat of welding rod or wire.

(1) All impact test specimens shall be of the Charpy type, keyhole or milled U-notch, and shall conform in all respects to Figure 3 of ASTM E-23-60T. Each set of impact specimens shall be taken across the weld and have the notch located in the weld metal. When the cylinder material thickness is 2.5 mm or thicker, impact specimens shall be cut from a cylinder or welded test plate used for the tensile or bend test specimens. The dimension along the axis of the notch shall be reduced to the largest possible of 10 mm, 7.5 mm, 5 mm or 2.5 mm, depending upon cylinder thickness. When the material in the cylinder or welded test plate is not of sufficient thickness to prepare 2.5 mm

¹The welded test plate shall be in the same condition and approximately the same thickness as the cylinder wall and shall be of material from one of the heats used in the lot of cylinders which it represents, except test plates for impact tests shall comply with § 178.57-17(d) (1). The test plate shall be welded by the same welding procedure as used on the particular cylinder seam being qualified and shall be subjected to the same heat treatment.

impact test specimens, 2.5 mm specimens shall be prepared from a welded test plate made from $\frac{1}{8}$ inch thick material meeting the requirements specified in § 178.57-21(a), Table 1, and having a carbon analysis of .05 minimum, but not necessarily from one of the heats used in the lot of cylinders. The test piece shall be welded by the same welding procedure as used on the particular cylinder seam being qualified and shall be subjected to the same heat treatment.

(2) Impact test specimens shall be cooled to the design service temperature. The apparatus for testing the specimens must conform to the requirements of ASTM Standard E-23-60T. The test piece, as well as the handling tongs, shall be cooled for a length of time sufficient to reach the service temperature. The temperature of the cooling device shall be maintained within a range of plus or minus 3° F. The specimen shall be quickly transferred from the cooling device to the anvil of the testing machine and broken within a time lapse of not more than six seconds.

(3) The impact properties of each set of impact specimens shall be not less than the values in the following table:

Size of specimen	Minimum impact value required for average of each set of three specimens (ft-lb)	Minimum impact value permitted on one specimen only of a set of three (ft-lb)
10 mm x 10 mm.....	15	10
10 mm x 7.5 mm.....	12.5	8.5
10 mm x 5 mm.....	10	7.0
10 mm x 2.5 mm.....	5	3.5

(4) When the average value of the three specimens equals or exceeds the minimum value permitted for a single specimen and the value for more than one specimen is below the required average value, or when the value for one specimen is below the minimum value permitted for a single specimen, a retest of three additional specimens shall be made. The value of each of these retest specimens shall equal or exceed the required average value. When an erratic result is caused by a defective specimen, or there is uncertainty in test procedure, a retest is authorized.

§ 178.57-18 Radiographic examination.

(a) The techniques and acceptability of radiographic inspection must conform to the standards set forth in CGA Pamphlet C-3.

(b) Cylinders must be examined as follows:

(1) One finished longitudinal seam shall be selected at random from each lot of 100 or less successively produced and be radiographed throughout its entire length. Should the radiographic examination fail to meet the requirements of paragraph (a) of this section, two additional seams of the same lot shall be examined, and if either of these fail to meet the requirements, each cylinder may be examined as outlined above, only those passing are acceptable.

§ 178.57-19 Rejected cylinders.

(a) Welds may be repaired by suitable methods of fusion welding; reheat treatment authorized; subsequent thereto, acceptable cylinders must pass all prescribed tests.

§ 178.57-20 Marking.

(a) Marking required by stamping plainly and permanently on shoulder or top head of jacket or on a permanently attached plate or head protective ring as follows:

(1) DOT-4L followed by the service pressure (for example, DOT-4L200).

(2) ST followed by service temperature (for example, ST-423 F) on cylinders having a service temperature below minus 320° F. only; location to be just below the DOT mark.

(3) Serial number and identifying symbol; location of number to be just below or immediately following the service temperature or DOT mark; location of symbol to be just below or immediately following the number. The symbol and numbers must be those of person making DOT mark. The symbol must be registered with the Bureau of Explosives; duplications unauthorized.

(4) Maximum weight of content (Max. Content 00#) on cylinders having a service temperature below minus 320° F. only; location near symbol.

Examples:

<i>Service temperature minus 320° F.</i>	<i>Service temperature below minus 320° F.</i>
DOT-4L200	DOT-4L200
1234	ST-423F
XY	1234
	XY
	MAX CONTENT 00#

(5) Inspector's official mark, date of test (such as 10-55 for October 1955) near serial number.

(6) Size of markings at least 1/4 inch high if space permits.

(b) Except for serial number, all markings prescribed in paragraph (a) of this section must be duplicated on each cylinder by any suitable means.

§ 178.57-21 Authorized steels.

(a) Electric furnace steel of uniform quality. Chemical analysis must conform to ASTM A-240, Type 304 Stainless Steel. The following chemical analyses and physical properties are authorized:

TABLE 1—AUTHORIZED MATERIALS

<i>Designation</i>	<i>Chemical analysis, limits in percent, stainless steel; type 304</i>
Carbon ¹	0.08 maxi- mum.
Manganese	2.00 maxi- mum.
Phosphorus	0.045 maxi- mum.
Sulphur	0.030 maxi- mum.
Silicon	1.00 maxi- mum.
Nickel	8.00-10.50.
Chromium	18.00-20.00.
Molybdenum	
Titanium	
Columbium	
	<i>Physical properties (annealed)</i>
Tensile strength, p.s.i. (mini- mum)	75,000.
Yield strength, p.s.i. (mini- mum)	30,000.
Elongation in 2-inch (mini- mum) (percent)	30.0.
Elongation other permissible gage lengths (percent)	15.0.

¹ The carbon analysis must be reported to the nearest hundreds of 1 percent.

NOTE 1: A heat of steel made under the above specifications is acceptable, even

though its check chemical analysis is slightly out of the specified range, if it is satisfactory in all other respects, provided the tolerances shown in the following table are not exceeded except as approved by the Department.

CHECK ANALYSIS TOLERANCES

Elements	Limit or maximum of specified range, percent	Tolerance over the maximum limit or under the minimum limit
Carbon.....	To 0.030, inclusive..... Over 0.030 to 0.20, inclu- sive.....	0.005 0.01
Manganese....	To 1.00, inclusive..... Over 1.00 to 3.00, inclusive.....	0.03 0.04
Phosphorus ¹ ..	To 0.040, inclusive..... Over 0.040 to 0.20, inclu- sive.....	0.005 0.010
Sulfur.....	To 0.040, inclusive.....	0.005
Silicon.....	To 1.00, inclusive.....	0.05
Chromium....	Over 15.00 to 20.00, inclu- sive.....	0.20
Nickel.....	Over 5.00 to 10.00, inclu- sive..... Over 10.00 to 20.00 inclu- sive.....	0.10 0.15

¹ Rephosphorized steels not subject to check analysis phosphorus.

§ 178.57-22 Inspector's report.

(a) Required to be clear, legible and in following form:

(Place)

(Date)

Steel gas cylinders.

Manufactured for

Location at

Manufactured by

Location at

Consigned to

Location at

Quantity

Size

by

inches outside diameter

inches long

Cylinders were pressure tested at

pounds per square inch and found to be

satisfactory.

Maximum and minimum weight

Maximum and minimum volumetric capac-
ity

Marks stamped into the

(Location of marking)

of the cylinder are:

Specification DOT-.....

Service Temperature

minus° F.

Maximum Weight of Content .. (pounds)

Serial numbers to inclusive

Inspector's mark

Identifying symbol (registered)

Test date

Tare weights (yes or no)

Other marks

These cylinders were made by process of

.....

The material used was authorized by
§ 178.57-21.

The material used was identified by the

following _____
 (Heat-purchase order)
 numbers _____
 The material used was verified as to chem-

ical analysis and record thereof is attached
 hereto. The heat numbers _____
 (were—were not)
 marked on the material.

Test No.	Heat No.	Check analysis No.	Cylinders represented (serial Nos.)	Chemical analysis										
				C	P	S	Si	Mn	Ni	Cr	Mo	Cu	Al	Zr

All material was inspected and all that was accepted was found free from seams, cracks, laminations and other injurious defects.

The compliance of cylinders with specification requirements was verified including markings, condition of inside, tests, threads, etc. All cylinders with defects which might prove injurious were rejected. The processes of manufacture and heat treatment were supervised and found to be efficient and satisfactory.

The cylinders walls were measured and the minimum thickness noted was _____ inch. The outside diameter was determined by a close approximation to be _____ inches. The wall stress was calculated to be _____ pounds per square inch under an internal pressure of _____ pounds per square inch.

Pressure tests, tensile tests of material, and other tests as prescribed in specification No. DOT-4L _____ were made in the presence of the inspector and all cylinders accepted were found to be in compliance with the requirements of that specification. Records thereof are attached hereto.

Each cylinder _____ been
 (Has—has not)
 equipped with safety devices as follows:

I hereby certify that all of these cylinders proved satisfactory in every way and comply

with the requirements of Department of Transportation specification No. 4L except as follows:

Exceptions _____

(Manufacturer's name)

By _____

(Signed) _____

(Inspector)

(Place) _____

(Date) _____

RECORD OF CHEMICAL ANALYSIS OF STEEL FOR CYLINDERS

Numbered _____ to _____ inclusive.
 Size _____ inches outside diameter by _____ inches long.

Made by _____ Company.
 For _____ Company.

Steel was manufactured by _____ Company. The originals of the certified mill test reports are in the files of the manufacturer.

NOTE: Any omission of analyses by heats, if authorized, must be accounted for by notation hereon reading "The prescribed certificate of the manufacturer of material has been secured, found satisfactory, and placed on file," or by attaching a copy of the certificate.

Chemical analyses were made by _____

(Date) _____

(Place) _____

RECORD OF PHYSICAL TESTS OF MATERIAL FOR CYLINDERS

Numbered _____ to _____ inclusive.

Size _____ inches outside diameter by _____ inches long

Made by _____ Company

For _____ Company

Test No.	Cylinders represented by test (serial Nos.)	Yield strength (pounds per square inch)	Tensile strength (pounds per square inch)	Elongation (percent in inches)	Impact test results	Weld tensile test	Weld bend test

(Signed) _____

§ 178.58 [Reserved]

§ 178.58-1 thru 178.58-23 [Reserved]

§ 178.59 Specification 8; steel cylinders with approved porous filling for acetylene.

§ 178.59-1 Compliance.

(a) Required in all details.

§ 178.59-2 Type and service pressure.

(a) *Type*. Seamless except that the following is authorized: Longitudinal seam if forge lap welded; attachment of heads by welding or by brazing by dipping process; welded circumferential body seam if cylinder has no longitudinal seam.

(b) *Service pressure*.¹ 250 pounds per square inch.

§ 178.59-3 Inspection by whom and where.

(a) Inspections and verifications must be performed by an independent inspection agency or, in the case of cylinders manufactured in the United States, a competent inspector of the manufacturer. Chemical analyses and tests as specified must be made within the United States.

(b) Duties of shell inspector:

(1) Inspect all material and reject any not complying with requirements; for cylinders made by billet piercing process, billets to be inspected after nick and cold break.

(2) Require certified chemical analyses of steel used, signed by manufacturer thereof; also verify by check analyses of samples taken from each heat or from 1 out of each lot of 200 or less plates, shells, or tubes used.

(3) Verify compliance of cylinder shells with all shell requirements; inspect inside before closing in both ends; verify heat treatment as proper; obtain all samples for all tests and for check analyses; witness all tests; verify threads by gauge; report volumetric capacity and minimum thickness of wall noted.

(4) Prepare report on manufacture of steel shells in form prescribed in § 178.59-20 (a). Furnish one copy to manufacturer and three copies to the company that is to complete the cylinders.

(c) Duties of inspector of completed cylinders: Determine porosity of filling and tare weights; verify compliance of marking with prescribed requirements; obtain necessary copies of steel shell reports prescribed in paragraph (b) of this section; render complete reports, as prescribed in § 178.59-20 to the purchaser and to the company that has completed the manufacture of the cylinders.

¹ Service pressure limits the use of the cylinder to 250 pounds per square inch at 70° F.

§ 178.59-4 Steel.

(a) Open-hearth, electric or basic oxygen process steel of uniform quality. Content percent for the following not over: carbon, 0.25; phosphorus, 0.045; sulphur, 0.050.

§ 178.59-5 Identification of steel.

(a) Required; any suitable method except that plates and billets for hot-drawn cylinders shall be marked with heat number.

§ 178.59-6 Defects.

(a) Material with seams, cracks, laminations, or other injurious defects, not authorized.

§ 178.59-7 Manufacture.

(a) By best appliances and methods; dirt and scale to be removed as necessary to afford proper inspection; no defect acceptable that is likely to weaken the finished cylinder appreciably; reasonably smooth and uniform surface finish required.

§ 178.59-8 Exposed bottom welds.

(a) Exposed bottom welds on cylinders over 18" long must be protected by footrings.

§ 178.59-9 Heat treatment.

(a) Body and heads formed by drawing or pressing must be uniformly and properly heat treated prior to tests.

§ 178.59-10 Openings.

(a) Standard taper pipe threads required; length not less than as specified for American Standard pipe threads; tapped to gauge; clean cut, even, and without checks.

§ 178.59-11 Safety devices and protection for valves, safety devices, and other connections.

(a) If applied must be as required by the Department's regulations that apply. (see §§ 173.34(d) and 173.301(g) of this chapter).

§ 178.59-12 Hydrostatic test.

(a) By water jacket, or other suitable method, operated so as to obtain accurate data. Pressure gauge must per-

mit reading to accuracy of 1 percent. Expansion gauge must permit reading of total expansion to accuracy either of 1 percent or 0.1 cubic centimeter.

(b) Pressure must be maintained for 30 seconds and sufficiently longer to insure complete expansion. Any internal pressure applied after heat-treatment and previous to the official test must not exceed 90 percent of the test pressure.

(c) Permanent volumetric expansion must not exceed 10 percent of total volumetric expansion at test pressure.

(d) One cylinder out of each lot of 200 or less must be hydrostatically tested to at least 750 pounds per square inch. Cylinders not so tested must be examined under pressure of between 500 and 600 pounds per square inch and show no defect. If hydrostatically tested cylinder fails, each cylinder in the lot may be hydrostatically tested and those passing are acceptable.

§ 178.59-13 Leakage test.

(a) By interior air or gas pressure not less than the service pressure; leakers must be rejected. Required only for cylinders with bottoms closed in by spinning.

§ 178.59-14 Physical test.

(a) Required on 2 specimens cut longitudinally from 1 cylinder or part thereof taken at random out of each lot of 200 or less, after heat treatment.

(b) Specimens must be: Gauge length 8" with width not over 1½"; or gauge length 2" with width not over 1½"; *Provided*, That gauge length at least 24 times thickness with width not over 6 times thickness is authorized when cylinder wall is not over ⅜" thick.

(c) The yield strength in tension shall be the stress corresponding to a permanent strain of 0.2 percent of the gauge length.

(1) The yield strength shall be determined by either the "offset" method or the "extension under load" method as prescribed in ASTM Standard E8-57T.

(2) In using the "extension under load" method, the total strain (or "ex-

tension under load") corresponding to the stress at which the 0.2 percent permanent strain occurs may be determined with sufficient accuracy by calculating the elastic extension of the gauge length under appropriate load and adding thereto 0.2 percent of the gauge length. Elastic extension calculations shall be based on an elastic modulus of 30,000,000. In the event of controversy, the entire stress-strain diagram shall be plotted and the yield strength determined from the 0.2 offset.

(3) For the purpose of strain measurement, the initial strain shall be set while the specimen is under a stress of 12,000 pounds per square inch, the strain indicator reading being set at the calculated corresponding strain.

(4) Cross-head speed of the testing machine shall not exceed $\frac{1}{8}$ inch per minute during yield strength determination.

(d) Yield strength shall not exceed 73 percent of tensile strength. Elongation must be at least 40 percent in 2 inch or 20 percent in other cases.

§ 178.59-15 Rejected cylinders.

(a) Reheat treatment authorized; subsequent thereto, acceptable cylinders must pass all prescribed tests. Repair by welding is authorized.

§ 178.59-16 Porous filling.

(a) Cylinders must be filled with an approved porous material of such structure that it will not disintegrate or sag when wet with solvent or when subjected to normal service. The porous filling material shall be uniform in quality and free of voids, except that a well drilled into the filling material beneath the valve is authorized: *Provided*, That such a well be filled with a material of such type that the functions of the filling material are not impaired. Overall shrinkage of the filling material is authorized, provided the total clearance between the cylinder shell and filling material, after solvent has been added, does not exceed $\frac{1}{2}$ of 1 percent of the respective diameter or length but in no case to exceed $\frac{1}{8}$ inch measured diametrically and longitudinally and that such clearances do not impair the functions of the filling material. In all cases, the filling material as installed in

the cylinder must be approved by the Bureau of Explosives.

(b) Porosity of filling to be 80 percent or less except that filling with a porosity in excess of 80 percent but not in excess of 92 percent, may be used when tested with satisfactory results under the supervision of the Bureau of Explosives. When the porous mass has a porosity in excess of 80 percent but not in excess of 83 percent, the pores shall be uniform and shall not be visible at a magnification of 200 diameters. When the porous mass has a porosity in excess of 83 percent but not in excess of 92 percent, the pores shall be uniform and shall not be visible at a magnification of 500 diameters. A cylinder taken at random from a lot of 200 or less must be tested for porosity providing the porosity of each cylinder is not known. Should test cylinders fail, test of each cylinder of the lot is authorized, cylinders passing the test to be acceptable.

(c) For filling that is molded and dried before insertion in cylinders, porosity test may be made on sample block taken at random from material to be used.

(d) The porosity of the filling material shall be determined; the amount of solvent at 70° F. for a cylinder:

(1) Having shell volumetric capacity above 20 pounds water capacity (nominal) shall not exceed the following:

Percent porosity of filler:	Maximum acetone solvent percent shell capacity by volume
90 to 92.....	43.4
87 to 90.....	42.0
83 to 87.....	40.0
80 to 83.....	38.6
75 to 80.....	36.2
70 to 75.....	33.8
65 to 70.....	31.4

(2) Having volumetric capacity of 20 pounds or less water capacity (nominal), shall not exceed the following:

Percent porosity of filler:	Maximum acetone solvent percent shell capacity by volume
90 to 92.....	41.8
83 to 90.....	38.5
80 to 83.....	37.1
75 to 80.....	34.8
70 to 75.....	32.5
65 to 70.....	30.2

§ 178.59-17 Tare weight.

(a) Tare weight referred to in §§ 178.59-1 to 178.59-21 shall be the combined weight of cylinder proper, porous filling, valve, and solvent, but without removable cap.

§ 178.59-18 Marking.

(a) Marking on each cylinder by stamping plainly and permanently on or near the shoulder, top head, neck or valve protection collar which is permanently attached to the cylinder and forming integral part thereof, as follows:

(1) DOT-8.

(2) A serial number and an identifying symbol (letters); grouped¹ above, below, or immediately following the DOT mark. The symbol and numbers must be those of person making DOT mark. The symbol must be registered with the Bureau of Explosives; duplications unauthorized.

Examples:

DOT-8
1234
XY
DOT-8-1234-XY

(3) Date of test (such as 5-50 for May 1950), so placed that dates of subsequent tests can be easily added.

(4) Tare weight of cylinder in pounds and ounces.

(5) Cylinders, not completed, when delivered must each be marked for identification of each lot of 200 or less.

§ 178.59-19 Size of marks.

(a) At least $\frac{1}{8}$ " high for cylinders less than 4" inside diameter and at least $\frac{1}{4}$ " high for larger cylinders.

§ 178.59-20 Inspector's report.

(a) Report to cover manufacture of acetylene shells; require to be clear, legible, and in the following form:

¹ Variation in location authorized only when necessitated by lack of space.

(Place) -----
(Date) -----

Acetylene shells

Manufactured for ----- Company
Location at -----
Manufactured by ----- Company
Location at -----
Consigned to ----- Company
Location at -----
Quantity -----

Size ----- inches outside diameter by -----
Inches long.
Marks stamped into the shoulder of the
cylinder are:

Lot number -----
Other marks (if any) -----
These cylinders were made by process of

The material used was identified by the
following ----- numbers
(heat-purchase order)

The material used was verified as to chemical
analysis and record thereof is attached
hereto. The heat numbers -----
(were—were not)

marked on the material.

All material, such as plates, billets and seamless tubing, was inspected and each cylinder was inspected both before and after closing in the ends; all that was accepted was found free from seams, cracks, laminations, and other defects which might prove injurious to the strength of the cylinder. The processes of manufacture and heat treatment of cylinders were supervised and found to be efficient and satisfactory.

The cylinder walls were measured and the minimum thickness noted was ----- inch. The outside diameter was determined by a close approximation to be ----- inches. The wall stress was calculated to be ----- pounds per square inch under an internal pressure of ----- pounds per square inch.

Hydrostatic tests, flattening tests, tensile tests of material, and other tests, as prescribed in specification No. DOT-8 were made in the presence of the inspector and all material and cylinders accepted were found to be in compliance with the requirements of that specification. Records thereof are attached hereto.

I hereby certify that all of these cylinders proved satisfactory in every way and comply with the requirements of Department of Transportation specification No. 8 except as follows:

Exceptions -----

(Signed) -----
Inspector

(Place)
(Date)

RECORD OF CHEMICAL ANALYSIS OF MATERIAL FOR CYLINDERS

Numbered to inclusive.
Size inches outside diameter by inches long
Made by Company
For Company

NOTE: Any omission of analyses by heats, if authorized must be accounted for by notation hereon reading "The prescribed certificate of the manufacturer of material has been secured, found satisfactory, and placed on file," or by attaching a copy of the certificate.

Test No.	Heat No.	Check analysis No.	Cylinders represented (serial Nos.)	Chemical analysis						
				C	P	S	Si	Mn	Ni	Cr

The analyses were made by
(Signed)

(Place)
(Date)

RECORD OF PHYSICAL TESTS OF MATERIAL FOR CYLINDERS

Numbered to inclusive.
Size inches outside diameter by inches long
Made by Company
For Company

Test No.	Cylinders represented by test (serial Nos.)	Yield strength (pounds per square inch)	Tensile strength (pounds per square inch)	Elongation (percent in 8 inches)	Reduction of area (percent)	Flattening test

(Signed)

(Place)
(Date)

RECORD OF HYDROSTATIC TESTS ON CYLINDERS

Numbered to inclusive.
Size inches outside diameter by inches long
Made by Company
For Company

Serial Nos. of cylinders tested arranged numerically	Actual test pressure (pounds per square inch)	Total expansion (cubic centimeters) ¹	Permanent Expansion (cubic centimeters) ¹	Percent ratio of permanent expansion to total expansion ¹	Volumetric capacity ²

NOTE: When specification requires test for only 1 out of each lot of 200 or less cylinders, the check on the others must be indicated by a notation hereon reading, "Each cylinder was subjected to a pressure of pounds per square inch and showed no defect."

¹ If the tests are made by a method involving the measurement of the amount of liquid forced into the cylinder by the test pressure, then the basic data, on which the calculations are made, such as the pump factors, temperature of liquid, coefficient of compressibility of liquid, etc., must also be given.

² Report approximate maximum and minimum volumetric capacity for the lot.

(Signed)

materials present, if any; definite statement as to the heat-treatment used.

§ 178.60 Specification 8AL; steel cylinders with approved porous filling for acetylene.

§ 178.60-1 Compliance.

(a) Required in all details.

§ 178.60-2 Type and service pressure.

(a) *Type.* Seamless except that the following is authorized: Attachment of heads by welding or by brazing by dipping process; welded circumferential body seam. Longitudinal seams not authorized.

(b) *Service pressure.*¹ 250 pounds per square inch.

§ 178.60-3 Inspection by whom and where.

(a) Inspections and verifications must be performed by an independent inspection agency or, in the case of cylinders manufactured in the United States, a competent inspector of the manufacturer. Chemical analyses and tests as specified must be made within the United States.

(b) Duties of shell inspector. Inspect all material and reject any not complying with requirements; for cylinders made by billet piercing process, billets to be inspected after nick and cold break.

(1) Require certified chemical analyses of steel used, signed by manufacturer thereof; also verify by check analyses of samples taken from each heat or from 1 out of each lot of 200 or less plates, shells, or tubes used.

(2) Verify compliance of cylinder shells with all shell requirements; inspect inside before closing in both ends; verify heat treatment as proper; obtain all samples for all tests and for check analyses; witness all tests; verify threads by gauge; report volumetric capacity and minimum thickness of wall noted.

(3) Report percentage of each specified alloying element in the steel. Prepare report on manufacture of steel shells in form prescribed in § 178.60-24

(a). Furnish one copy to manufacturer

¹Service pressure limits the use of the cylinder to 250 pounds per square inch at 70° F.

and three copies to the company that is to complete the cylinders.

(c) Duties of inspector of completed cylinders. Determine porosity of filling and tar weights; verify compliance of marking with prescribed requirements; obtain necessary copies of steel shell reports prescribed in paragraph (b) of this section; render complete reports, as prescribed in § 178.60-24, to the purchaser, and to the company that has completed the manufacture of the cylinders.

§ 178.60-4 Authorized steel.

(a) As specified in Table I of Appendix A to this part.

§ 178.60-5 Identification of steel.

(a) Required; any suitable method except that plates and billets for hot-drawn cylinders shall be marked with heat number.

§ 178.60-6 Defects.

(a) Material with seams, cracks, laminations, or other injurious defects, not authorized.

§ 178.60-7 Manufacture.

(a) By best appliances and methods; dirt and scale to be removed as necessary to afford proper inspection; no defect acceptable that is likely to weaken the finished cylinder appreciably; reasonably smooth and uniform surface finish required.

§ 178.60-8 Footrings.

(a) Exposed bottom welds on cylinders over 18" long must be protected by footrings.

§ 178.60-9 Welding or brazing.

(a) The attachment to the tops or bottoms only of cylinders by welding or brazing of neckrings, footrings, handlers, bosses, pads, and valve protecting rings is authorized provided that such attachments and the portion of the container to which they are attached are made of weldable steel, the carbon content of which must not exceed 0.25 percent.

(b) Heat treatment is not required after welding or brazing weldable low carbon parts to attachments, specified in paragraph (a) of this section, of similar material which have been previously

welded or brazed to the top or bottom of cylinders and properly heat treated, provided such subsequent welding or brazing does not produce a temperature in excess of 400° F. in any part of the top or bottom material.

§ 178.60-10 Wall thickness; wall stress.

(a) The calculated wall stress at 750 pounds per square inch shall not exceed 35,000 pounds per square inch, or one-half of the minimum ultimate strength of the steel as determined in § 178.60-16, whichever value is the smaller. Measured wall thickness shall not include galvanizing or other protective coating.

(1) Calculation of wall stress must be made by the formula:

$$S = \frac{P(1.3D^2 + 0.4d^2)}{D^2 - d^2}$$

where

S = wall stress in pounds per square inch;
 P = 750 pounds per square inch (minimum test pressure);
 D = outside diameter in inches;
 d = inside diameter in inches.

Either D or d must be calculated from the relation $D = d + 2t$, where t = minimum wall thickness.

(2) Cylinders with wall thickness less than 0.100 inch, the ratio of straight side wall length to outside diameter shall not exceed 3.5.

(3) For cylinders having outside diameter over 5 inches, the minimum wall thickness shall be 0.087 inch.

§ 178.60-11 Heat treatment.

(a) Each cylinder must be uniformly and properly heat treated, prior to tests, by any suitable method in excess of 1100° F. Heat treatment must be accomplished after all forming and welding operations, except that when brazed joints are used, heat treatment must follow any forming and welding operations but may be done before, during, or after the brazing operations. Liquid quenching not authorized.

§ 178.60-12 Openings.

(a) Standard taper pipe threads required; length not less than as specified for American Standard pipe threads; tapped to gauge; clean cut, even, and without checks.

§ 178.60-13 Safety devices and protection for valves, safety devices, and other connections.

(a) If applied must be as required by the Department's regulations that apply.

(See §§ 173.34(d) and 173.301(g) of this chapter).

§ 178.60-14 Hydrostatic test.

(a) By water jacket, or other suitable method, operated so as to obtain accurate data. Pressure gauge must permit reading to accuracy of 1 percent. Expansion gauge must permit reading of total expansion to accuracy either of 1 percent or 0.1 cubic centimeter.

(b) Pressure must be maintained for 30 seconds and sufficiently longer to insure complete expansion. Any internal pressure applied after heat-treatment and previous to the official test must not exceed 90 percent of the test pressure.

(c) Permanent volumetric expansion must not exceed 10 percent of total volumetric expansion at test pressure.

(d) One cylinder out of each lot of 200 or less must be hydrostatically tested to at least 750 pounds per square inch. Cylinders not so tested must be examined under pressure of between 500 and 600 pounds per square inch and show no defect. If hydrostatically tested cylinder fails, each cylinder in the lot may be hydrostatically tested and those passing are acceptable.

§ 178.60-15 Leakage test.

(a) By interior air or gas pressure not less than the service pressure; leakers must be rejected. Required only for cylinders with bottoms closed in by spinning.

§ 178.60-16 Physical test.

(a) Required on 2 specimens cut longitudinally from 1 cylinder or part thereof taken at random out of each lot of 200 or less, after heat treatment.

(b) Specimens must be: Gauge length 8" with width not over 1½"; or, gauge length 2" with width not over 1½". *Provided*, That gauge length at least 24 times thickness with width not over 6 times thickness is authorized when cylinder wall is not over ⅜" thick.

(c) The yield strength in tension shall be the stress corresponding to a permanent strain of 0.2 percent of the gauge length.

(1) The yield strength shall be determined by either the "offset" method or

the "extension under load" method as prescribed in ASTM Standard E8-57T.

(2) In using the "extension under load" method, the total strain (or "extension under load") corresponding to the stress at which the 0.2 percent permanent strain occurs may be determined with sufficient accuracy by calculating the elastic extension of the gauge length under appropriate load and adding thereto 0.2 percent of the gauge length. Elastic extension calculations shall be based on an elastic modulus of 30,000,000. In the event of controversy, the entire stress-strain diagram shall be plotted and the yield strength determined from the 0.2 offset.

(3) For the purpose of strain measurement, the initial strain shall be set while the specimen is under a stress of 12,000 pounds per square inch, the strain indicator reading being set at the calculated corresponding strain.

(4) Cross-head speed of the testing machine shall not exceed $\frac{1}{8}$ inch per minute during yield strength determination.

§ 178.60-17 Elongation.

(a) Physical test specimens must show at least 40 percent for 2 inch gauge length or at least 20 percent in other cases, except that these elongation percentages may be reduced numerically by 2 for 2 inch specimens and 1 in other cases for each 7,500 pounds per square inch increment of tensile strength above 50,000 pounds per square inch to a maximum of four such increments.

§ 178.60-18 Weld tests.

(a) Specimens taken across the circumferentially welded seam must be cut from one cylinder taken at random from each lot of 200 or less cylinders after heat treatment and must pass satisfactorily the following tests:

(1) *Tensile test.* A specimen shall be cut from one cylinder of each lot of 200 or less, or welded test plate.¹ The specimen must be taken across the major

seam and must be prepared and tested in accordance with and must meet the requirements of CGA Pamphlet C-3. Should this specimen fail to meet the requirements, specimens may be taken from two additional cylinders or welded test plates from the same lot and tested. If either of the latter specimens fail to meet the requirements, the entire lot represented shall be rejected.

(2) *Guided bend test.* A "root" bend test specimen shall be cut from the cylinder or welded test plate, used for the tensile test specified in subparagraph (1) of this paragraph. Specimens must be prepared and tested in accordance with and must meet the requirements of CGA Pamphlet C-3.

(3) *Alternate guided-bend test.* This test may be used and must be as required by CGA Pamphlet C-3. The specimen shall be bent until the elongation at the outer surface, adjacent to the root of the weld, between the lightly scribed gage lines—a to b, shall be at least 20 percent, except that this percentage may be reduced for steels having a tensile strength in excess of 50,000 pounds per square inch, as provided in § 178.60-17(a).

§ 178.60-19 Rejected cylinders.

(a) Reheat treatment authorized; subsequent thereto, acceptable cylinders must pass all prescribed tests. Repair by welding is authorized.

§ 178.60-20 Porous filling.

(a) Cylinders must be filled with an approved porous material of such structure that it will not disintegrate or sag when wet with solvent or when subjected to normal service. The porous filling material shall be uniform in quality and free of voids, except that a well drilled into the filling material beneath the valve is authorized: *Provided*, That such a well be filled with a material of such type that the functions of the filling material are not impaired. Overall shrinkage of the filling material is authorized, provided the total clearance between the cylinder shell and filling material, after solvent has been added, does not exceed $\frac{1}{2}$ of 1 percent of the respective diameter or length but in no case to exceed $\frac{1}{8}$ inch measured diametrically and longitudinally and that such clearances do not

¹ The welded test plate shall be of one of the heats in the lot of 200 or less which it represents, in the same condition and approximately the same thickness as the cylinder wall except that in no case shall it be of lesser thickness than that required for a one-quarter size Charpy impact specimen. The weld must be made by the same procedure and subjected to the same heat treatment as the major weld on the cylinder.

impair the functions of the filling material. In all cases, the filling material as installed in the cylinder must be approved by the Bureau of Explosives.

(b) Porosity of filling to be 80 percent or less except that filling with a porosity in excess of 80 percent but not in excess of 92 percent, may be used when tested with satisfactory results under the supervision of the Bureau of Explosives. When the porous mass has a porosity in excess of 80 percent but not in excess of 83 percent, the pores shall be uniform and shall not be visible at a magnification of 200 diameter. When the porous mass has a porosity in excess of 83 percent but not in excess of 92 percent, the pores shall be uniform and shall not be visible at a magnification of 500 diameters. A cylinder taken at random from a lot of 200 or less must be tested for porosity providing the porosity of each cylinder is not known. Should test cylinders fail, test of each cylinder of the lot is authorized, cylinders passing the test to be acceptable.

(c) For filling that is molded and dried before insertion in cylinders, porosity test may be made on sample block taken at random from material to be used.

(d) The porosity of the filling material shall be determined; the amount of solvent at 70° F. for a cylinder:

(1) Having shell volumetric capacity above 20 pounds water capacity (nominal) shall not exceed the following:

Maximum acetone solvent percent shell capacity by volume	
Percent porosity of filler:	
90 to 92.....	43.4
87 to 90.....	42.0
83 to 87.....	40.0
80 to 83.....	38.6
75 to 80.....	36.2
70 to 75.....	33.8
65 to 70.....	31.4

(2) Having volumetric capacity of 20 pounds or less water capacity (nominal), shall not exceed the following:

Maximum acetone solvent percent shell capacity by volume	
Percent porosity of filler:	
90 to 92.....	41.8
83 to 90.....	38.6
80 to 83.....	37.1
75 to 80.....	34.8
70 to 75.....	32.5
65 to 70.....	30.2

§ 178.60-21 Tare weight.

(a) Tare weight here referred to shall be the combined weight of cylinder proper, porous filling, valve, and solvent, but without removable cap.

§ 178.60-22 Marking.

(a) Marking on each cylinder as follows:

(1) DOT-8AL.

(2) A serial number and an identifying symbol (letters); grouped¹ above, below, or immediately following the DOT mark. The symbol and numbers must be those of person making DOT mark. The symbol must be registered with the Bureau of Explosives; duplications unauthorized.

DOT-8AL

1234

XY

DOT-8AL-1234-XY

(3) Date of test (such as 5-50 for May 1950) so placed that dates of subsequent tests can be easily added.

(4) Tare weight of cylinder in pounds and ounces.

(5) Cylinders, not completed, when delivered must each be marked for identification of each lot of 200 or less.

(b) Markings shall be stamped plainly and permanently in locations in accordance with the following:

(1) On shoulders and top heads not less than 0.087 inch thick, or

(2) On neck, valve boss, valve protection sleeve, or similar part permanently attached to the top end of cylinder, or

(3) On a plate of ferrous material attached to the top of the cylinder or permanent part thereof; the plate must be at least $\frac{1}{16}$ inch thick, and must be attached by welding, or by brazing at a temperature of at least 1,100° F. throughout all edges of the plate. Sufficient space must be left on the plate to provide for stamping at least four (4) retest dates.

¹ Variation in location authorized only when necessitated by lack of space.

§ 178.60-23 Size of marks.

(a) At least $\frac{1}{8}$ " high for cylinders less than 4" inside diameter and at least $\frac{1}{4}$ " high for larger cylinders.

§ 178.60-24 Inspector's report.

(a) Report to cover manufacture of acetylene shells; required to be clear, legible, and in the following form:

(Place) _____
(Date) _____

Acetylene shells

Manufactured for _____ Company
Location at _____
Manufactured by _____ Company
Location at _____
Consigned to _____ Company
Location at _____
Quantity _____
Size _____ inches outside diameter by _____ inches long.
Marks stamped into the shoulder of the cylinder are:
Lot number _____
Other marks (if any) _____
These cylinders were made by process of _____

The _____ permitted in (neckrings, footrings, etc.) _____

§ 178.60-9 were attached by process of _____ (welding—brazing)

The material used was identified by the following _____ numbers _____ (heat-purchase order)

The material used was verified as to chemical analysis and record thereof is attached hereto. The heat numbers _____ (were—were not)

marked on the material.

All material, such as plates, billets and seamless tubing, was inspected and each cylinder was inspected both before and after closing in the ends; all that was accepted was found free from seams, cracks, laminations, and other defects which might prove injurious to the strength of the cylinder. The processes of manufacture and heat treatment of cylinders were supervised and found to be efficient and satisfactory.

The cylinder walls were measured and the minimum thickness noted was _____ inch. The outside diameter was determined by a close approximation to be _____ inches. The wall stress was calculated to be _____ pounds per square inch under an internal pressure of _____ pounds per square inch.

Hydrostatic tests, flattening tests, tensile tests of material, and other tests, as prescribed in specification No. DOT-8AL were made in the presence of the inspector and all material and cylinders accepted were found to be in compliance with the requirements of that specification. Records thereof are attached hereto.

I hereby certify that all of these cylinders proved satisfactory in every way and comply with the requirements of Department of Transportation specification No. 8AL except as follows:

Exceptions: _____

(Signed) _____
Inspector

(Place) _____
(Date) _____

RECORD OF CHEMICAL ANALYSIS OF STEEL FOR CYLINDERS

Numbered _____ to _____ inclusive.
Size _____ inches outside diameter by _____ inches long
Made by _____ Company
For _____ Company

Test No.	Heat No.	Check analysis No.	Cylinders represented (serial Nos.)	Chemical analysis										
				C	P	S	Si	Mn	Ni	Cr	Mo	Cu	Al	Zr

Steel was manufactured by _____ Company.

The originals of the certified mill test reports are in the files of the manufacturer.

NOTE: Any omission of analysis by heats, if authorized, must be accounted for by notation hereon reading, "The prescribed certificate of the manufacturer of material has been secured, found satisfactory, and placed on file," or by attaching a copy of the certificate.

The analyses were made by _____ (Signed) _____

(Place).....
(Date).....

RECORD OF PHYSICAL TESTS OF MATERIAL FOR CYLINDERS

Numbered to inclusive.
Size inches outside diameter by inches long
Made by Company
For Company

Test No.	Cylinders represented by test (serial Nos.)	Yield strength (pounds per square inch)	Tensile strength (pounds per square inch)	Elongation (percent in 8 inches)	Reduction of area (percent)	Weld tensile test	Weld bend test

(Signed)

(Place).....
(Date).....

RECORD OF HYDROSTATIC TESTS ON CYLINDERS

Numbered to inclusive.
Size inches outside diameter by inches long
Made by Company
For Company

Serial Nos. of cylinders tested arranged numerically	Actual test pressure (pounds per square inch)	Total expansion (cubic centimeters) ¹	Permanent expansion (cubic centimeters) ¹	Percent ratio of permanent expansion to total expansion ¹	Volumetric capacity ²

NOTE: When specification requires test for only 1 out of each lot of 200 or less cylinders, the check on the other must be indicated by a notation hereon reading, "Each cylinder was subjected to a pressure of pounds per square inch and showed no defect."

¹ If the tests are made by a method involving the measurement of the amount of liquid forced into the cylinder by the test pressure, then the basic data, on which the calculations are made, such as the pump factors, temperature of liquid, coefficient of compressibility of liquid, etc., must also be given.

² Report approximate maximum and minimum volumetric capacity for the lot.

(Signed)

(b) Inspector's report to cover completed manufacture of acetylene cylinders; required to be clear and legible and in the following form:

(Place).....
(Date).....

Final Report: For completed steel cylinders with approved porous filling for acetylene.

Manufactured for

Location at

Steel sheets manufactured by

Location at

Cylinders completed by

Location at

Consigned to

Location at

Quantity

Size inches outside diameter by inches long.

Marks are stamped into
(show location)

as follows:

Specification DOT-8AL

Serial numbers to inclusive.

Identifying symbol (registered)

Inspector's mark (if applied)

Test date

Other marks (if any)

Application of prescribed marks, as reported above, and location thereof were verified.

Each cylinder was filled with porous filling material consisting of in the form of

The porosity of the filling is between and percent as determined by tests made by the company whose report has been found satisfactory and is on file.

The tare weight of each cylinder was determined and a record thereof is attached hereto.

Each cylinder has been equipped with safety devices -----

A certified report of manufacture and test of the steel shells is attached hereto.

I hereby certify that, subject to the acceptability of the reports covering the steel shells, all of these cylinders proved satisfactory in every way and comply with the requirements of the Department of Transportation specification No. 8AL.

Signed -----
(Inspector)

§ 178.61 Specification 4BW; welded steel cylinders made of definitely prescribed steels with electric-arc welded longitudinal seam.

§ 178.61-1 Compliance.

(a) Required in all details.

§ 178.61-2 Type, size and service pressure.

(a) Must be welded type with longitudinal electric-arc welded seam not over 1,000 pounds water capacity (nominal); service pressure at least 225 and not over 500 pounds per square inch gauge. Cylinders closed in by spinning process not authorized.

§ 178.61-3 Inspection by whom and where.

Inspections and verifications must be performed by an independent inspection agency or, in the case of cylinders manufactured in the United States, a competent inspector of the manufacturer. Chemical analyses and test as specified must be made within the United States.

§ 178.61-4 Duties of inspector.

(a) Inspect all material and reject any not complying with requirements of this specification.

(b) Verify chemical analysis of each heat of material by analysis or by obtaining certified analysis: *Provided*, That a

certificate from the manufacturer thereof giving sufficient data to indicate compliance with requirements is acceptable when verified by check analyses of samples taken from one cylinder out of each lot of 200 or less.

(c) Verify compliance of cylinders with specification requirements including: markings; condition of inside; tests; threads; heat treatment. Obtain samples for all tests, and check chemical analyses, witness all tests; report volumetric capacity, tare weight (see report form), and minimum thickness of wall noted.

(d) Render complete report (§ 178.61-21) to purchaser and cylinder maker.

§ 178.61-5 Authorized steel.

(a) As specified in Table I of Appendix A to this part.

(b) *Heads*. Material for heads shall be the same as paragraph (a) of this section or shall be open hearth, electric or basic oxygen carbon steel of uniform quality. Content percent for the following not over: Carbon 0.25, Manganese 0.60, Phosphorus 0.045, Sulfur 0.050.

(1) Heads shall be hemispherical or ellipsoidal in shape with a maximum ratio of 2.1. If low carbon steel is used thickness of such heads shall be determined by using a maximum wall stress of 24,000 p.s.i. in formula (§ 178.61-10(a)).

§ 178.61-6 Identification of material.

(a) Required; any suitable method.

§ 178.61-7 Defects.

(a) Material with seams, cracks, laminations or other injurious defects, not authorized.

§ 178.61-8 Manufacture.

(a) By suitable appliances and methods; dirt and scale to be removed as necessary to afford proper inspection; no defect acceptable that is likely to weaken the finished cylinder appreciably; reasonably smooth and uniform surface required. Exposed bottom welds on cylinders over 18 inches long must be

protected by footings. Minimum thickness of heads shall be not less than 90 percent of the required thickness of the sidewall. Heads shall be concave to pressure.

(b) *Circumferential seams.* By electric-arc welding. Joints shall be butt with one member offset (joggle butt) or lap with minimum overlap of at least four times nominal sheet thickness.

(c) *Longitudinal seams in shells.*

(1) Longitudinal electric-arc welded seams shall be of the butt welded type. Welds must be made by a machine process including automatic feed and welding guidance mechanisms. Longitudinal seams shall have complete joint penetration, and shall be free from undercuts, overlaps or abrupt ridges or valleys. Misalignment of mating butt edges shall not exceed $\frac{1}{16}$ of nominal sheet thickness or $\frac{1}{16}$ inch whichever is less. All joints with nominal sheet thickness up to and including $\frac{1}{8}$ inch shall be tightly butted. When nominal sheet thickness is greater than $\frac{1}{8}$ inch, the joint shall be gapped with maximum distance equal to one-half the nominal sheet thickness or $\frac{1}{16}$ inch whichever is less. Joint design, preparation and fit-up shall be such that requirements of § 178.61-8(d) are satisfied.

(2) Maximum joint efficiency shall be 1.0 when each seam is radiographed completely. Maximum joint efficiency shall be 0.90 when one cylinder from each lot of 50 consecutively welded cylinders is spot radiographed. In addition, one out of the first five cylinders welded following a shut down of welding operations exceeding four hours shall be spot radiographed. Spot radiographs, when required, shall be made of a finished welded cylinder and shall include the girth weld for 2 inches in both directions from the intersection of the longitudinal and girth welds and include at least 6 inches of the longitudinal weld. Maximum joint efficacy of 0.75 shall be permissible without radiography.

(d) Welding procedure and operators must be qualified in accordance with the sections of CGA Pamphlet C-3 that apply.

§ 178.61-9 Welding of attachments.

(a) The attachment to the tops and bottoms only of cylinders by welding of neckrings, footings, handles, bosses, pads and valve protection rings is authorized provided that such attachments and the portion of the container to which they are attached are made of weldable steel, the carbon content of which must not exceed 0.25 percent.

§ 178.61-10 Wall thickness.

(a) For outside diameters over 6 inches the minimum wall thickness shall be 0.078 inch. In any case the minimum wall thickness shall be such that the wall stress calculated by the formula (see Note 1):

$$S = \frac{2P(1.3D^2 + 0.4d^2)}{E(D^2 - d^2)}$$

shall not exceed the lesser value of any of the following:

(1) The value shown in Table I, § 178.61-5(a) for the particular material under consideration.

(2) One-half of the minimum tensile strength of the material determined as required in § 178.61-15.

(3) 35,000 pounds per square inch.

NOTE 1: In the formula above quoted

S = wall stress, p.s.i.;

P = service pressure, p.s.i.;

D = outside diameter, inches;

d = inside diameter, inches;

E = joint efficiency of the longitudinal seam (from § 178.61-8(c)(2)).

(b) In any cylinder with wall thickness less than 0.100 inch, the ratio of tangential length to outside diameter shall not exceed 4.0.

§ 178.61-11 Heat treatment.

(a) Each cylinder must be uniformly and properly heat treated prior to test by the applicable method shown in § 178.61-5(a), Table I. Heat treatment must be accomplished after all forming and welding operations.

(b) Heat treatment is not required after welding or brazing weldable low carbon parts to attachments of similar material which have been previously welded to the top or bottom of cylinders

and properly heat treated, provided such subsequent welding or brazing does not produce a temperature in excess of 400° F. in any part of the top or bottom material.

§ 178.61-12 Openings in cylinders.

(a) All openings must be in the heads or bases.

(b) Openings in cylinders must be provided with adequate fittings, bosses, or pads, integral with or securely attached to the cylinder by welding.

(c) Threads must comply with the following:

(1) Threads must be clean cut and to gauge.

(2) Taper threads must be of length not less than as specified for American Standard Taper Pipe threads.

(3) Straight threads, having at least 4 engaged threads, to have tight fit and calculated shear strength at least 10 times the test pressure of the cylinder; gaskets required, adequate to prevent leakage.

(d) Closure of fittings, boss or pads must be adequate to prevent leakage.

§ 178.61-13 Safety relief devices and protection for valves, safety devices and other connections, if applied.

(a) Must be as required by the Department's regulations that apply, (See §§ 173.34(d) and 173.301(g) of this chapter).

§ 178.61-14 Hydrostatic test.

(a) By water jacket, or other suitable method, operated so as to obtain accurate data. Pressure gauge must permit readings to accuracy of 1 percent. Expansion gauge must permit readings of total volumetric expansion to accuracy either of 1 percent or 0.1 cubic centimeter.

(b) Pressure must be maintained for 30 seconds and sufficiently longer to insure complete expansion. Any internal pressure applied after heat treatment and previous to the official test must not exceed 90 percent of the test pressure.

(c) Permanent volumetric expansion must not exceed 10 percent of the total volumetric expansion at test pressure.

(d) Cylinders must be tested as follows:

(1) At least 1 cylinder selected at random out of each lot of 200 or less shall be tested as outlined in paragraphs (a), (b), and (c) of this section to at least two times service pressure.

(2) All cylinders not tested as outlined in subparagraph (d)(1) of this section must be examined under pressure of at least two times service pressure and show no defect.

(e) One finished cylinder selected at random out of each lot of 500 or less successively produced shall be hydrostatically tested to 4 times service pressure without bursting.

§ 178.61-15 Physical test.

(a) To determine yield strength, tensile strength and elongation of material. Required on a specimen cut from each head and body section of a cylinder having passed the hydrostatic test.

(b) Specimens must be: Gauge length 8 inches with width not over 1½ inches; or, gauge length 2 inches with width not over 1½ inches, provided, that gauge length at least 24 times thickness with width not over 6 times thickness is authorized when cylinder wall is not over ⅜ inch thick. The specimen, exclusive of grip ends, must not be flattened. Grip ends may be flattened to within 1 inch of each end of the reduced section. When size of cylinder does not permit securing straight specimens, the specimens may be taken in any location or direction and may be straightened or flattened cold, by pressure only, not by blows; when specimens are so taken and prepared, the inspector's report must show in connection with record of physical tests detailed information in regard to such specimens. Heating of specimens for any purpose is not authorized.

(c) The yield strength in tension shall be the stress corresponding to a permanent strain of 0.2 percent of the gauge length.

(1) The yield strength shall be determined by either the "off-set" method or the "extension under load" method as prescribed in ASTM Standard E8-57T.

(2) In using the "extension under load" method, the total strain (or "extension under load"), corresponding to the stress at which the 0.2-percent permanent strain occurs may be determined with sufficient accuracy by calculating

the elastic extension of the gauge length under appropriate load and adding thereto 0.2 percent of the gauge length. Elastic extension calculations shall be based on an elastic modulus of 30,000,000. In the event of controversy, the entire stress-strain diagram shall be plotted and the yield strength determined from the 0.2-percent offset.

(3) For the purpose of strain measurement, the initial strain reference shall be set while the specimen is under a stress of 12,000 pounds per square inch, the strain indicator reading being set at the calculated corresponding strain.

(4) Cross-head speed of the testing machine shall not exceed $\frac{1}{8}$ inch per minute during yield strength determination.

§ 178.61-16 Elongation.

(a) Physical test specimens must show at least 40 percent for 2-inch gauge length or at least 20 percent in other cases, except that these elongation percentages may be reduced numerically by 2 for 2-inch specimens and by 1 in other cases for each 7,500 pounds per square inch increment of tensile strength above 50,000 pounds per square inch to a maximum of four increments.

§ 178.61-17 Tests of welds.

(a) *Tensile test.* A specimen shall be cut from one cylinder of each lot of 200 or less. The specimen must be taken across the longitudinal seam and must be prepared and tested in accordance with and must meet the requirements of CGA Pamphlet C-3.

(b) *Guided bend test.* A "root" test specimen shall be cut from the cylinder used for the tensile test specified in § 178.61-17(a). Specimens must be taken across the longitudinal seam and must be prepared and tested in accordance with and must meet the requirements of CGA Pamphlet C-3.

(c) *Alternate guided bend test.* This test may be used and must be as required by CGA Pamphlet C-3. The specimen shall be bent until the elongation at the outer surface, adjacent to the root of the weld, between the lightly scribed gauge lines a to b, shall be at least 20 percent, except that this percentage may be reduced for steels having a tensile strength

in excess of 50,000 pounds per square inch, as provided in § 178.61-16(a).

§ 178.61-18 Radiographic examination.

(a) Radiographic inspection must conform to the techniques and acceptability criteria set forth in CGA Pamphlet C-3. When fluoroscopic inspection is used, permanent film records need not be retained.

(b) Should spot radiographic examination fail to meet the requirements of paragraph (a) of this section, two additional welds from the same lot of 50 cylinders or less shall be examined, and if either of these fail to meet the requirements, each cylinder shall be examined as previously outlined; only those passing are acceptable.

§ 178.61-19 Rejected cylinders.

(a) Unless otherwise stated, if a sample cylinder or specimen taken from a lot of cylinders fails the prescribed test, then two additional specimens must be selected from the same lot and subjected to the prescribed test. If either of these fail the test then the entire lot must be rejected.

(b) Reheat treatment authorized; subsequent thereto, acceptable cylinders must pass all prescribed tests. Repair of welded seams by welding is authorized provided that all defective metal be cut away and joint be rewelded as prescribed for original welded joints.

§ 178.61-20 Marking.

(a) Marking on each cylinder stamped as follows:

(1) DOT-4BW followed by the service pressure (for example, DOT-4BW240, etc.).

(2) The serial number and identifying symbol of person making DOT mark. The symbol must be registered with the Bureau of Explosives. Duplications unauthorized.

(3) Inspector's official mark.

(4) Date of test (for example, 12-64 for December 1964).

(5) Additional markings are permitted.

(b) *Sequence of marks.* DOT specification designation, registered symbol and serial number shall be in close proximity. Inspector's official mark shall be near the serial number. Date of test shall be so placed that dates of subsequent tests can easily be added.

(c) *Location of markings.* Markings may be stamped plainly and permanently in the following locations on the cylinder:

(1) On shoulders and top heads not less than 0.087-inch thick.

(2) On neck, valve boss, valve protection sleeve, or similar part permanently attached to top end of cylinder.

(3) On a plate attached to the top of the cylinder or permanent part thereof; sufficient space must be left on the plate to provide for stamping at least six re-test dates; the plate must be at least $\frac{1}{16}$ -inch thick and must be attached by welding, or by brazing at a temperature of at least 1100° F. throughout all edges of the plate.

(4) Variations in location of markings when necessitated by lack of space permissible only when authorized by the Department.

(d) *Size of marks.* Space permitting, at least $\frac{1}{4}$ -inch high.

§ 178.61-21 Inspector's report.

(a) Required to be clear, legible and in following form:

(Place) _____
(Date) _____

Steel gas cylinders

Manufactured for _____ Company
Location at _____
Manufactured by _____ Company
Location at _____
Consigned to _____ Company
Location at _____
Quantity _____
Size _____ inches outside diameter
by _____ inches long
Marks stamped into the _____
(location of marking)
of the cylinder are:
Specification DOT- _____
Serial numbers _____ to _____ inclusive
Inspector's mark _____
Identifying symbol (registered) _____

Test date _____
Tare weights (yes or no) _____
Other marks _____

These cylinders were made by process of _____

The material used was type _____
authorized in table I of Spec. No. 4BW.

The material used was identified by the following _____

(heat-purchase order)
numbers _____

The material used was verified as to chemical analysis and record thereof is attached hereto. The heat numbers _____

(were—were not)
marked on the material.

All material was inspected and all that was accepted was found free from seams, cracks, laminations and other injurious defects.

Radiography _____
(type and amount)

The compliance of cylinders with specification requirements was verified including markings, condition of inside, tests, threads, etc. All cylinders with defects which might prove injurious were rejected. The processes of manufacture and heat treatment were supervised and found to be efficient and satisfactory.

The cylinder walls were measured and the minimum thickness noted was _____ inch. The outside diameter was determined to be _____ inches. The wall stress was calculated to be _____ pounds per square inch.

Hydrostatic tests, tensile tests of material, and other tests as prescribed in specification No. DOT-4BW _____ were made in the presence of the inspector and all cylinders accepted were found to be in compliance with the requirements of that specification. Records thereof are attached hereto.

Each cylinder _____ been
(has—has not)
equipped with safety devices as follows: _____

I hereby certify that all of these cylinders proved satisfactory in every way and comply with the requirements of Department of Transportation specification No. 4BW except as follows:

Exceptions _____

(Manufacturer's name)
(Signed) _____

(Inspector)

By: _____

(Place)

(Date)

RECORD OF CHEMICAL ANALYSIS OF STEEL FOR CYLINDERS

Numbered to inclusive.
 Size inches outside diameter by inches long
 Made by Company
 For Company

Test No.	Heat No.	Check analysis No.	Cylinders represented (serial Nos.)	Chemical analysis										
				C	P	S	Si	Mn	Ni	Cr	Mo	Cu	Al	Zr

Steel was manufactured by Company.
 The original of the certified mill test reports are in files of the manufacturer.

NOTE: Any omission of analyses by heats, if authorized, must be accounted for by notation hereon reading "The prescribed certificate of the manufacturer of material has been secured, found satisfactory, and placed on file," or by attaching a copy of the certificate.

Chemical analyses were made by

(Place)

(Date)

RECORD OF PHYSICAL TESTS OF MATERIAL FOR CYLINDERS

Numbered to inclusive.
 Size inches outside diameter by inches long
 Made by Company
 For Company

Test No.	Cylinders represented by test (serial Nos.)	Yield strength (pounds per square inch)	Tensile strength (pounds per square inch)	Elongation (percent in inches)	Reduction of area (percent)	Weld tensile test	Weld bend test

(Signed)

(Place)

(Date)

RECORD OF HYDROSTATIC TESTS ON CYLINDERS

Numbered to inclusive.
 Size inches outside diameter by inches long
 Made by Company
 For Company

Serial Nos. of cylinders tested arranged numerically	Actual test pressure (pounds per square inch)	Total expansion (cubic centimeters) ¹	Permanent expansion (cubic centimeters) ¹	Permanent ratio of permanent expansion to total expansion ¹	Burst test (pounds per square inch)	Tare weight (pounds) ²	Volumetric capacity ³

NOTE 1: When specifications require test for only one out of each lot of 200 or less cylinders, the check on the others must be indicated by a notation hereon reading, "Each cylinder was subjected to a pressure of pounds per square inch and showed no defect."

¹ If the tests are made by a method involving the measurement of the amount of liquid forced into the cylinder by the test pressure, then the basic data, on which the calculations are made, such as the pump factors, temperature of liquid, coefficient of compressibility of liquid, etc., must also be given.

² Do not include removable cap but state whether with or without valve. These weights must be accurate to a tolerance of one percent.

³ Report approximate maximum and minimum volumetric capacity for the lot.

(Signed)

§ 178.63 [Reserved]

§ 178.65 Specification 39; non-reusable (non-refillable) cylinder.

§ 178.65-1 Compliance.

Each cylinder must meet the applicable requirements of § 173.24 of this chapter.

§ 178.65-2 Type, size, service pressure, and test pressure.

(a) Type: Each cylinder must be of seamless, welded, or brazed construction. Spherical pressure vessels are authorized and covered by references to cylinders in this specification.

(b) Size limitation: Maximum water capacity may not exceed:

(1) 55 pounds (1,526 cubic inches) for a service pressure of 500 p.s.i.g. or less, and

(2) 10 pounds (277 cubic inches) for a service pressure in excess of 500 p.s.i.g.

(c) Service pressure: The marked service pressure may not exceed 80 percent of the test pressure.

(d) Test pressure: The minimum test pressure is the maximum pressure of contents at 130° F. or 180 p.s.i.g. whichever is greater.

(e) The term "pressure of contents" as used in this specification means the total pressure of all the materials to be shipped in the cylinder.

§ 178.65-3 Inspection by whom and where.

(a) In the case of cylinders having marked service pressures higher than 900 p.s.i.g., inspections and verifications must be performed by an independent inspection agency.

(b) In the case of cylinders having marked service pressures of 900 p.s.i.g. or lower, inspections and verifications must be performed by an independent inspection agency or, in the case of cylinders manufactured in the United States, by a competent inspector of the manufacturer.

(c) Chemical analyses and tests as specified must be made within the United States.

§ 178.65-4 Duties of inspector.

(a) The inspector must determine that all material used complies with the requirements of this specification.

(b) The inspector must verify compliance with the requirements of § 178.65-5 by making a chemical analysis or obtaining a certified chemical analysis from the material manufacturer for each heat of material (ladle analysis acceptable). If an analysis is not provided by the material manufacturer, a sample from each coil, sheet, or tube must be analyzed.

(c) The inspector must determine that each cylinder is made and marked in compliance with this specification by:

(1) Complete internal and external inspection (interested inspectors authorized);

(2) Verification of proper heat treatment (if any);

(3) Selection of samples to be tested;

(4) Witnessing all tests; and

(5) By preparation of required report.

§ 178.65-5 Material; steel or aluminum.

(a) Steel:

(1) The steel analysis must conform to the following:

	Ladle analysis	Check analysis
Carbon, maximum percent.....	0.12	0.15
Phosphorus, maximum percent.....	0.04	0.05
Sulfur, maximum percent.....	0.05	0.06

(2) For a cylinder made of seamless steel tubing with integrally formed ends, hot drawn, and finished, content percent for the following must not exceed: carbon, 0.55; phosphorous, 0.045; sulfur, 0.050.

(3) For non-heat treated welded steel cylinders, adequately killed deep drawing quality steel is required.

(4) Longitudinal or helical welded cylinders are not authorized for service pressures in excess of 500 p.s.i.g.

(b) Aluminum: Aluminum not authorized for service pressures in excess of 500 p.s.i.g. Analysis of aluminum must conform to Aluminum Association standard designated for alloys 1100, 1170, 3003, 5052, 5086, 5154, 6061, and 6063 specified in its publication entitled "Aluminum

Standards and Data" (1970-71 edition dated December 1969).

(c) Material with seams, cracks, laminations, or other injurious defects not permitted.

(d) Material used must be identified by any suitable method.

§ 178.65-6 Manufacture.

(a) General manufacturing requirements are as follows:

(1) Dirt and scale must be removed prior to inspection and processing.

(2) The surface finish must be uniform and reasonably smooth.

(3) Inside surfaces must be clean, dry, and free of loose particles.

(4) No defect of any kind is permitted if it is likely to weaken a finished cylinder.

(b) Requirements for seams:

(1) Brazing is not authorized on aluminum cylinders.

(2) Brazing material must have a melting point of not lower than 1,000° F.

(3) Braze seams must be assembled with proper fit to insure complete penetration of the brazing material throughout the brazed joint.

(4) Minimum width of brazed joints must be at least four times the thickness of the shell wall.

(5) Braze seams must have design strength equal to or greater than 1.5 times the minimum strength of the shell wall.

(6) Welded seams must be properly aligned and welded by a method that provides clean, uniform joints with adequate penetration.

(7) Welded joints must have strength equal to or greater than the minimum strength of the shell material in the finished cylinder.

(c) Attachments to the cylinder are permitted by any means which will not be detrimental to the integrity of the cylinder. Welding or brazing of attachments to the cylinder must be completed prior to all pressure tests.

§ 178.65-7 Wall thickness.

(a) The minimum wall thickness must be such that the wall stress at test pressure does not exceed the yield strength of the material of the finished cylinder wall.

(b) Calculation of the stress for cylinders must be made by the formula

$$S = \frac{P(1.3D^2 + 0.4d^2)}{D^2 - d^2}$$

where:

S = Wall stress, in p.s.i.;

P = Test pressure;

D = Outside diameter, in inches;

d = Inside diameter, in inches.

(c) Calculation of the stress for spheres must be made by the formula:

$$S = \frac{PD}{4t}$$

where:

S = Wall stress, in p.s.i.;

P = Test pressure;

D = Outside diameter, in inches;

t = Minimum wall thickness, in inches.

§ 178.65-9 Openings and attachments.

(a) Openings and attachments are permitted on heads only.

(b) All openings and their reinforcements must be within an imaginary circle, concentric to the axis of the cylinder. The diameter of the circle may not exceed 80 percent of the outside diameter of the cylinder. The plane of the circle must be parallel to the plane of a circumferential weld and normal to the long axis of the cylinder.

(c) Unless a head has adequate thickness, each opening must be reinforced by a securely attached fitting, boss, pad, collar, or other suitable means.

(d) Material used for welded openings and attachments must be of weldable quality and compatible with the material of the cylinder.

§ 178.65-10 Safety devices.

Safety devices must meet the requirements of § 173.34(d) of this chapter.

§ 178.65-11 Pressure tests.

(a) Each cylinder must be tested at an internal pressure of at least the test pressure and must be held at that pressure for at least 30 seconds.

(1) The leakage test must be conducted by submersion under water or by some other method that will be equally sensitive.

(2) If the cylinder leaks, evidences visible distortion, or any other defect, while under test, it must be rejected (see § 178.65-13).

(b) One cylinder taken from the beginning of each lot, and one from each 1,000 or less successively produced within

the lot thereafter, must be hydrostatically tested to destruction. The entire lot must be rejected if (see § 178.65-13):

(1) A failure occurs at a gage pressure less than 2.0 times the test pressure.

(2) A failure initiates in a braze or a weld or the heat affected zone thereof;

(3) A failure is other than in the side-wall of a cylinder longitudinal with its long axis, or

(4) In a sphere, a failure occurs in any opening, reinforcement, or at a point of attachment.

(c) A "lot" is defined as the quantity of cylinders successively produced per production shift (not exceeding 10 hours) having identical size, design, construction, material, heat treatment, finish, and quality.

§ 178.65-12 Flattening test.

(a) One cylinder must be taken from the beginning of production of each lot (as defined above) and subjected to a flattening test.

(1) The flattening test must be made on a cylinder that has been tested at test pressure.

(2) A ring taken from a cylinder may be flattened as an alternative to a test on a complete cylinder. The test ring must not include the heat affected zone or any weld. However, for a sphere, the test ring may include the circumferential weld if it is located at a 45 degree angle to the ring, ± 5 degrees.

(3) The flattening must be between 60 degrees included-angle, wedge shaped knife edges, rounded to a 0.5 inch radius.

(4) Cylinders and test rings must not crack when flattened so that their outer surfaces are not more than six times wall thickness apart when made of steel or not more than ten times wall thickness apart when made of aluminum.

(b) If any cylinder or ring cracks when subjected to the specified flattening test, the lot of cylinders represented by the test must be rejected (see § 178.65-13).

§ 178.65-13 Rejected cylinders.

(a) If the cause for rejection of a lot is determinable, and if by test or inspection defective cylinders are eliminated from the lot, the remaining cylinders must be qualified as a new lot under §§ 178.65-11 and 178.65-12.

(b) Repairs to welds are permitted. Following repair, a cylinder must pass the pressure test specified in § 178.65-11(a).

(c) If a cylinder made from seamless steel tubing fails the flattening test described in § 178.65-12, suitable uniform heat treatment must be used on each cylinder in the lot. All prescribed tests must be performed subsequent to this heat treatment.

§ 178.65-14 Markings.

(a) The markings required by this section must be durable and waterproof. The requirements of § 173.24(c)(1)(ii) and (iv) of this chapter do not apply to this section.

(b) Required markings are as follow:

(1) DOT-39.

(2) NRC.

(3) The service pressure.

(4) The test pressure.

(5) The registration number (M****) of the manufacturer.

(6) The lot number.

(7) The date of manufacture if the lot number does not establish the date of manufacture.

(8) The following statement: .

Federal law forbids transportation if re-filled—penalty up to \$25,000 fine and 5 years imprisonment (49 U.S.C. 1809).

(c) The markings required by paragraph (b)(1) through (5) of this section must be in numbers and letters at least $\frac{1}{8}$ inch high and displayed sequentially. For example:

DOT-39 NRC 250/500 M1001.

(d) No person may mark any cylinder with the specification identification "DOT-39" unless (1) it was manufactured in compliance with the requirements of this section and (2) its manufacturer has a registration number (M****) from the Office of Hazardous Materials, Department of Transportation, Washington, D.C. 20590.

§ 178.65-15 Inspector's report.

(a) The inspector's report must be retained by the manufacturer for a period of 3 years and must be available for examination by representatives of the Department.

(b) The report must be legible, and contain at least the following information:

INSPECTION REPORT COVERING THE MANUFACTURE OF SPECIFICATION DOT-39 CYLINDERS OR SPHERES

The cylinders (spheres) covered by this report were manufactured for ----- located at ----- They were manufactured by ----- located at ----- whose Department of Transportation registration number is M----- The cylinders are ----- inches in diameter (OD) and ----- inches in length. They have a design test pressure of ----- p.s.i.g. and a marked

service pressure of ----- p.s.i.g. Each has an internal volume of ----- cubic inches (nominal).

These containers were made by process of -----

The metal used was identified by heat or analysis numbers as shown on the "Record of Chemical Analysis of Metal" attached hereto.

All material and each cylinder was inspected. All accepted material was found free from seams, cracks, laminations, and other defects which might prove injurious to the strength of the cylinder. The processes of manufacture and heat treatment (if any) were observed and found satisfactory.

My record of tests and inspection for each lot covered by this report is as follows:

Lot No.	Lot quantity	Lot tests		All cylinders	
		Burst-pressure ¹	Flattening test ²	Pressure tests ³	Visual inspection ³
-----	-----	-----	-----	-----	-----
-----	-----	-----	-----	-----	-----
-----	-----	-----	-----	-----	-----

¹ Enter the lowest actual failure pressure of all cylinders tested within the lot.

² Enter "Pass" or "Fail".

Inspector's name (print)

Date

Inspector's signature

Inspector's employer (company name)

thorized for not over 1,000 pounds water capacity (nominal).

(b) *Service pressure.*¹ At least 225 to not over 500 pounds per square inch.

§ 178.68-3 Inspection by whom and where.

§ 178.66 [Reserved]

§ 178.67 [Reserved]

§ 178.68 Specification 4E; welded aluminum cylinders.

§ 178.68-1 Compliance.

(a) Required in all details.

§ 178.68-2 Type, size and service pressure.

(a) *Type and size.* Must be constructed of not more than two seamless drawn shells with no more than one circumferential weld. The circumferential weld must not be closer to the point of tangency of the cylindrical portion with the shoulder than 20 times the cylinder wall thickness. Cylinders or shells closed in by spinning process and cylinders with longitudinal seams are not authorized. Ap-

Inspections and verifications must be performed by an independent inspection agency or, in the case of cylinders manufactured in the United States, a competent inspector of the manufacturer. Chemical analyses and tests as specified must be made within the United States.

¹ The "service pressure" limits the use of the cylinder. It is shown by marks on cylinders; for example DOT-4E240 indicates the service pressure as 240 pounds per square inch.

§ 178.68-4 Duties of inspector.

(a) Inspect all material and reject any material not complying with requirements.

(b) Verify chemical analysis of each lot of material by analysis or by obtaining certified analysis: *Provided*, That a certificate from the manufacturer thereof, giving sufficient data to indicate compliance with requirements, is acceptable when verified by check analysis of samples taken from one aluminum cylinder out of each lot of 200 or less.

(c) Verify compliance of cylinders with all requirements including markings; inspect inside before closing in both ends; verify properties as proper; obtain samples for all tests and check chemical analysis; witness all tests; verify threads by gauge; report volumetric capacity, tare weight (see report form) and wall thickness as approved.

(d) Render complete report (§ 178.68-20) to purchaser and cylinder maker.

§ 178.68-5 Aluminum.

(a) Shall be of uniform quality. The following chemical analyses are authorized.

TABLE I—AUTHORIZED MATERIALS

Designation	Chemical analysis— limits in percent 5154 ¹
Iron plus silicon	0.45 maximum.
Copper	0.10 maximum.
Manganese	0.10 maximum.
Magnesium	3.1/3.9.
Chromium	0.15/0.35.
Zinc	0.20 maximum.
Titanium	0.20 maximum.
Others, each	0.05 maximum.
Others, total	0.15 maximum.
Aluminum	Remainder.

¹ Analysis shall regularly be made only for the elements specifically mentioned above. If, however, the presence of other elements is indicated in the course of routine analysis, further analysis should be made to determine conformance with the limits specified for other elements.

§ 178.68-6 Identification of material.

(a) Required; any suitable method that will identify the alloy and manufacturer's lot number.

§ 178.68-7 Defects.

(a) Material with seams, cracks, laminations or other injurious defects not authorized.

§ 178.68-8 Manufacture.

(a) By best processes and methods; dirt and foreign particles to be removed as necessary to afford proper inspection; no defect acceptable that is likely to weaken the finished cylinder appreciably; reasonably smooth and uniform surface finish required; all welding must be by the gas shielded arc process.

§ 178.68-9 Welding.

(a) The attachment to the tops and bottoms only of cylinders by welding of neckrings or flanges, footrings, handles, bosses and pads and valve protection rings is authorized: *Provided*, That such attachments and the portion of the cylinder to which it is attached are made of weldable aluminum alloys.

§ 178.68-10 Wall thickness.

(a) The minimum wall thickness of the cylinder shall be 0.140 inch. In any case, the minimum wall thickness shall be such that calculated wall stress at twice service pressure shall not exceed the lesser value of either of the following:

(1) 20,000 pounds per square inch.

(2) One-half of the minimum tensile strength of the material as required in § 178.63-15.

(b) Calculation must be made by the formula:

$$S = \frac{P(1.3D^2 + 0.4d^2)}{D^2 - d^2}$$

where:

S=wall stress in pounds per square inch;
P=minimum test pressure prescribed for water jacket test;

D=outside diameter in inches;

d=inside diameter in inches.

(c) Minimum thickness of heads and bottoms shall not be less than the minimum required thickness of the side wall.

§ 178.68-11 Opening in cylinder.

(a) All openings must be in the heads or bases.

(b) Each opening in cylinders, except those for safety devices, must be provided with a fitting, boss, or pad, securely attached to cylinder by welding by inert gas shielded arc process or by threads. If threads are used, they must comply with the following:

(1) Threads must be clean-cut, even, without checks and cut to gauge.

(2) Taper threads to be of length not less than as specified for American Standard taper pipe threads.

(3) Straight threads, having at least 4 engaged threads, to have tight fit and calculated shear strength at least 10 times the test pressure of the cylinder; gaskets required, adequate to prevent leakage.

(c) Closure of fitting, boss, or pad must be adequate to prevent leakage.

§ 178.68-12 Safety devices and protection for valves, safety devices, and other connections if applied.

(a) Must be as required by the Department's regulations that apply (see §§ 173.34(d), 173.124(a), and 173.301(g) of this chapter).

§ 178.68-13 Hydrostatic test.

(a) By water jacket, or other suitable method, operated so as to obtain accurate data. Pressure gauge must permit reading to accuracy of 1 percent. Expansion gauge must permit reading of total expansion to accuracy either of 1 percent or 0.1 cubic centimeter.

(b) Pressure of 2 times service pressure must be maintained for 30 seconds and sufficiently longer to insure complete expansion. Any internal pressure applied previous to the official test must not exceed 90 percent of the test pressure. If, due to failure of the test apparatus, the test pressure cannot be maintained, the test may be repeated at a pressure increased by 10 percent over the pressure otherwise specified.

(c) Permanent volumetric expansion must not exceed 12 percent of total volumetric expansion at test pressure.

(d) Cylinders having a calculated wall stress of 18,000 pounds per square inch or less at test pressure may be tested as follows:

(1) At least one cylinder selected at random out of each lot of 200 or less shall be tested in accordance with paragraphs (a), (b), and (c) of this section.

(2) All cylinders not tested as provided in subparagraphs (d) (1) of this section must be examined under pressure of at least two times service pressure and show no defect.

(e) One finished cylinder selected at random out of each lot of 1,000 or less shall be hydrostatically tested to 4 times the service pressure without bursting. Inability to meet this requirement shall result in rejection of the lot.

§ 178.68-14 Flattening test.

(a) After hydrostatic testing, a flattening test is required on one section of a cylinder, taken at random out of each lot of 200 or less as follows:

(1) If the weld is not at midlength of the cylinder, the test section must be no less in width than 30 times the cylinder wall thickness. The weld must be in the center of the section. Weld reinforcement must be removed by machining or grinding so that the weld is flush with the exterior of the parent metal. There must be no evidence of cracking in the sample when it is flattened between flat plates to no more than 6 times the wall thickness.

(2) If the weld is at midlength of the cylinder, the test may be made as specified in subparagraph (1) of this paragraph or must be made between wedge shaped knife edges (60° angle) rounded to a 1/2-inch radius. There must be no evidence of cracking in the sample when it is flattened to no more than 6 times the wall thickness.

§ 178.68-15 Physical test.

(a) To determine yield strength, tensile strength, elongation, and reduction of area of material. Required on 2 specimens cut from one cylinder or part thereof taken at random out of each lot of 200 or less.

(b) Specimens must be: Gauge length 8 inches with width not over 1 1/2 inches; or gauge length 2 inches with width not over 1 1/2 inches. The specimen, exclusive of grip ends, must not be flattened. Grip ends may be flattened to within 1 inch of each end of the reduced section. When size of cylinder does not permit securing straight specimens, the specimens may be taken in any location or direction and may be straightened or flattened cold, by pressure only, not by blows; when specimens are so taken and prepared, the

inspector's report must show in connection with record of physical test detailed information in regard to such specimens. Heating of specimen for any purpose is not authorized.

(c) The yield strength in tension shall be the stress corresponding to a permanent strain of 0.2 percent of the gauge length.

(1) The yield strength shall be determined by the "offset" method as prescribed in ASTM Standard E8-57T.

(2) Cross-head speed of the testing machine shall not exceed $\frac{1}{4}$ inch per minute during yield strength determination.

§ 178.68-16 Acceptable results for physical tests.

(a) Elongation at least 7 percent; yield strength not over 80 percent of tensile strength.

§ 178.68-17 Weld tests.

(a) *Reduced section tensile test.* A specimen shall be cut from the cylinder used for the physical tests specified in § 178.68-15. Specimen shall be taken across the seam, edges shall be parallel for a distance of approximately 2 inches on either side of the weld. The specimen must be fractured in tension. The apparent breaking stress calculated on the minimum wall thickness must be at least equal to 2 times the stress calculated under § 178.68-10(b), and in addition must have an actual breaking stress of at least 30,000 pounds per square inch. Should this specimen fail to meet the requirements, specimens may be taken from 2 additional cylinders from the same lot and tested. If either of the latter specimens fails to meet requirements, the entire lot represented shall be rejected.

(b) *Guided bend test.* A bend test specimen shall be cut from the cylinder used for the physical tests specified in § 178.68-15. Specimen shall be taken across the seam, shall be $1\frac{1}{2}$ inches wide, edges shall be parallel and rounded with a file, and back-up strip, if used, shall be removed by machining. The specimen must be bent to refusal in the guided bend test jig illustrated in paragraph 6.10 of CGA Pamphlet C-3. The root of

the weld (inside surface of the cylinder) shall be located away from the ram of the jig. No specimen shall show a crack or other open defect exceeding $\frac{1}{4}$ inch in any direction upon completion of the test. Should this specimen fail to meet the requirements, specimens may be taken from each of 2 additional cylinders from the same lot and tested. If either of the latter specimens fail to meet requirements, the entire lot represented shall be rejected.

§ 178.68-18 Rejected cylinders.

(a) Repair of welded seams is authorized. Acceptable cylinders must pass all prescribed tests.

§ 178.68-19 Marking.

(a) Marking on each cylinder by stamping plainly and permanently on shoulder, top head, neck or valve protection collar which may be permanently attached to the cylinder and forming an integral part thereof, as follows:

(1) DOT-4E followed by the service pressure (for example, DOT-4E240).

(2) A serial number and an identifying symbol (letters); location of the number to be just below or immediately following the DOT mark; location of symbol to be just below or immediately following the number. The symbol and numbers must be those of person making DOT mark. The symbol must be registered with the Bureau of Explosives; duplications unauthorized.

Examples:

DOT-4E240
1234
XY
DOT-4E240-1234-XY

(3) Inspector's official mark, near serial number: Date of test (such as 5-50 for May 1950), so placed that date of subsequent test can be easily added.

(4) Size of marks. Shall be at least $\frac{1}{4}$ inch high.

§ 178.68-20 Inspector's reports.

(a) Required to be clear, legible, and in following form:

(Place) -----

(Date) -----

Gas cylinders

Manufactured for ----- Company

Location at -----

Manufactured by ----- Company

Location at -----

Consigned to ----- Company

Location at -----

Quantity -----

Size ----- inches outside diameter by ----- inches long.

Marks stamped into the shoulder of the cylinder are:

Specification DOT -----

Serial numbers ----- to ----- inclusive.

Inspector's mark -----

Identifying symbol (registered) -----

Test date -----

Tare weights (yes or no) -----

Other marks (if any) -----

These cylinders were made by process of -----

The ----- permitted in

(Neckrings, footrings, etc.)

§ 178.68-9 were attached by process of -----

The material used was identified by the following -----

numbers -----

The material used was verified as to chemical analysis and record thereof is attached hereto.

All material, such as aluminum plate, was inspected before manufacture and the drawn cylinder shells were inspected before final fabrication and found free from seams, cracks, laminations and other defects which

might prove injurious to the strength of the cylinder; the processes of manufacture were found to be efficient and satisfactory.

The cylinder walls were measured and the minimum thickness noted was ----- inch. The outside diameter was determined by a close approximation to be ----- inches. The wall stress was calculated to be ----- pounds per square inch under an internal pressure of ----- pounds per square inch.

Hydrostatic tests, flattening tests, tensile tests of material and other tests as prescribed in Specification DOT-4E were made in the presence of the inspector and all material and cylinders accepted were found to be in compliance with the requirements of that specification. Records thereof are attached hereto.

I hereby certify that all of these cylinders proved satisfactory in every way and comply with the requirements of Department of Transportation specification No. 4E except as follows:

Exceptions: -----

(Signed) -----

Inspector.

(Place) -----

(Date) -----

RECORD OF CHEMICAL ANALYSIS OF MATERIAL FOR CYLINDERS

Numbered ----- to ----- inclusive.

Size ----- inches outside diameter by ----- inches long.

Made by ----- Company

For ----- Company

NOTE: Any omission of analyses by heats, if authorized, must be accounted for by notation hereon reading "The prescribed certificate of the manufacturer of material has been secured, found satisfactory, and placed on file," or by attaching a copy of the certificate.

Test No.	Check analysis No.	Cylinders represented (Serial Nos.)	Chemical analysis							
			Mg	Cr	Cu	Mn	Zn	Ir	Al	Ti
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

The analyses were made by -----

(Signed) -----

(Place) -----

(Date) -----

Stainless steel, when used, must be, except for rolling hoops and chime reinforcement, an austenitic 18 or 8 chrome nickel alloy with carbon content not over 0.08 percent, or other equivalent grades.

§ 178.80-5 Seams.

(a) Body seams welded.

§ 178.80-6 Chime reinforcement.

(a) Containers over 25 gallons capacity, with flanged head secured to body, to have chime reinforcement adequate for its protection.

§ 178.80-7 Parts and dimensions.

(a) Parts and dimensions as follows:

Marked capacity not over (gallons)	Type of container	Minimum thickness, uncoated sheets (gauge)		Rolling hoops		
		Body sheet	Head sheet	Type ¹	Size (gauge or inch)	Weight (pounds per foot)
5.....	Straight side.....	22	22	None.....		
10.....	do.....	20	20	do.....		
33.....	do.....	14	14	do.....		
33.....	do.....	18	18	U.....	16	
55.....	do.....	16	16	U.....	14	
110.....	do.....	14	14	U.....	12	
33.....	do.....	18	18	I-bar.....	$\frac{3}{4} \times 1\frac{1}{4}$	1.25
55.....	do.....	16	16	I-bar.....	$\frac{3}{4} \times 1\frac{1}{4}$	1.25
110.....	do.....	14	14	I-bar.....	$\frac{3}{4} \times 1\frac{1}{4}$	1.25
33.....	do.....	16	16	(²).....		
55.....	do.....	14	14	(²).....		
33.....	Bilge.....	14	16	None.....		
55.....	do.....	13	14	do.....		

¹ Rolling hoops of pliable solid rubber or other suitable material are also authorized when approved as to type and construction by the Bureau of Explosives.

² Rolled or swaged in hoops.

³ In addition to the normal rolling hoops, the body of each removable head drum must have a rolled or swaged in hoop the center-line of which shall be not more than 3 inches from the top curl.

(b) Steel sheets of specified gauges shall comply with the following:

Gauge No.	Nominal thickness ¹ (inch)	Minimum thickness ¹ (inch)
13.....	0.0897	0.0817
14.....	.0747	.0677
16.....	.0598	.0533
18.....	.0478	.0428
20.....	.0359	.0324
22.....	.0299	.0269

¹ Thickness shall be measured at any point on the sheet not less than $\frac{1}{4}$ inch from an edge.

§ 178.80-8 Rolling hoops.

(a) Separate hoops to have tight fit on shell and be firmly secured in place. Beading under rolling hoops not permitted. Attachment to drum body by spot welding, except for continuous resistance method, not permitted. Welding of I-bar type directly to body of drum in any manner not permitted.

§ 178.80-9 Closures.

(a) Adequate to prevent leakage; gaskets required.

(b) Closing part (plug, cap, plate, etc., see Note 1) must be of metal as thick as prescribed for head of container; this not required for containers of 12 gallons

or less when the opening to be closed is not over 2.7 inches in diameter. If unthreaded cap is used it must be provided with outside sealing devices which cannot be removed without destroying the cap or sealing device.

NOTE 1: This does not apply to cap seal over a closure which complies with all requirements.

(c) For closure with threaded plug or cap, the seat (flange, etc.) for plug, or cap, must have 3 or more complete threads; two drainage holes of not over $\frac{5}{16}$ -inch diameter are allowed. Plug, or cap, must have sufficient length of thread to engage 3 threads when screwed home with basket in place.

(d) Full removable head drums over 5 gallons capacity must be closed by means of 12 gauge bolted ring with drop forged lugs, one of which is threaded, and having $\frac{3}{8}$ inch bolt and nut for drums not over 30 gallons capacity and $\frac{5}{8}$ inch bolt and nut for drums over 30 gallons capacity. Five gallon drums must be of lug type closure with cover having at least 16 lugs. Equally efficient types of closures are authorized upon demonstration and proof of satisfactory tests to representative of Bureau of Explosives.

§ 178.80-10 Defective containers.

(a) Leaks and other defects to be repaired by method used in constructing container, not by soldering.

§ 178.80-11 Marking.

(a) Marking on each container by embossing on head, except that such embossment must be on the permanent head for drums having removable heads, with raised marks, or by embossing or die stamping on footring on drums equipped with footrings, or on metal plates securely attached to drum by brazing or welding not less than 20 percent of the perimeter, as follows:

(1) DOT-5. In addition, when the container is of stainless steel, the type of steel used in body and head sheets as identified by American Iron and Steel Institute type number, and also the letters HT following steel designation on containers subjected to stress relieving or heat treatment during manufacture (for example, DOT-5-304 or DOT-5-304 HT as applicable), shall be shown.

(2) Name or symbol of person making the marks specified in paragraph (a) (1) of this section. Symbol, if used, must be registered with the Bureau of Explosives.

(3) Gauge of metal in thinnest part, rated capacity in gallons, and year of manufacture (for example, 14-55-50). When gauge of metal in body differs from that in head, both must be indicated with slanting line between and with gauge of metal indicated first (for example 14/12-55-50 for body 14 gauge and head 12 gauge).

§ 178.80-12 Size of markings.

(a) Size of markings (minimum): $\frac{1}{2}$ " high for 33-gallon or less, $\frac{3}{4}$ " for over 33 and not over 55 gallons, and 1" for over 55 gallons.

§ 178.80-13 Type tests.

(a) Samples taken at random and closed as for use, shall withstand prescribed tests without leakage. Tests to be made of each type and size by each company starting production and to be repeated every 4 months. Samples last tested to be retained until further tests are made or for 1 year, whichever period is shorter. The type tests are as follows:

(1) Test by dropping, filled with water to 98 percent capacity, from height of 4 feet onto solid concrete so as to strike diagonally on chime, or when without chime seam, to strike on other circumferential seam; also additional drop test on any other parts which might be considered weaker than the chime. Closing devices and other parts projecting beyond chime or rolling hoops must also be capable of withstanding this test.

(2) Hydrostatic pressure test of 40 pounds per square inch sustained for 5 minutes; except that full removable head drums must sustain 20 pounds per square inch.

(3) Periodic drop and hydrostatic tests are not required when containers fabricated of stainless steel have satisfactorily withstood prescribed tests at the original start of production. Satisfactory test results must be obtained on samples of subsequent containers that have been altered in design or construction. In instances where manufacturers have suspended production for an interval of 12 months or more, drop and hydrostatic tests must be again conducted as prescribed in subparagraphs (1) and (2) of this paragraph as for original start of production. Samples last tested to be retained until further tests are made or for one year, whichever period is shorter.

§ 178.80-14 Leakage test.

(a) Each container shall be tested, with seams under water or covered with soapsuds or heavy oil, by interior air pressure of at least 15 pounds per square inch. Equally efficient means of testing are authorized upon demonstration and proof of satisfactory tests to representative of Bureau of Explosives. Leakers shall be rejected or repaired and retested. Removable head containers not required to be tested with heads in place except that samples taken at random and closed as for use, of each type and size, must be tested at start of production and repeated every 4 months. Samples last tested to be retained until further tests are made or for 1 year, whichever period is shorter.

§ 178.81 Specification 5A; steel barrels or drums.

Removable head containers not authorized.

§ 178.81-1 Compliance.

(a) Required in all details.

§ 178.81-2 Rated capacity.

(a) Rated capacity as marked, see § 178.81-11 (a) (3). Actual capacity of straight-sided containers shall be not less than rated (marked) capacity plus 2 percent, nor greater than rated capacity plus 2 percent plus 1 quart, except that for containers over 30 gallons marked capacity actual capacity shall be not less than rated capacity plus 2 percent, nor greater than rated capacity plus 2 percent plus 2 quarts; actual capacity of bilge-type containers must be not less than rated capacity nor greater than rated capacity plus 2 percent plus 2 quarts.

§ 178.81-3 Composition.

(a) Sheets for body and heads to be low carbon, open hearth or electric steel.

§ 178.81-5 Seams.

(a) Body seams welded.
(b) Head and chime seams welded or double-seamed.
(c) Flanges for closures welded in place.

§ 178.81-6 Chime reinforcement.

(a) Containers over 25 gallons capacity, with flanged head secured to body, to have chime reinforcement adequate for its protection.

§ 178.81-7 Parts and dimensions.

(a) Parts and dimensions as follows:

Marked capacity not over (gallons)	Type of container	Minimum thickness, uncoated sheets (gauge)		Rolling hoops		
		Body sheet	Head sheet	Type ¹	Minimum	
					Size (gauge or inch)	Weight (pounds per foot)
10.....	Straight side.....	16	16	None.....		
30.....	do.....	16	16	I-bar.....	¾×1¼	1.25
55.....	do.....	14	14	I-bar.....	do.....	1.60
110.....	do.....	12	12	do.....	do.....	1.80
30.....	Bilge.....	14	16	None.....		
55.....	do.....	13	14	do.....		

¹ Rolling hoops of pliable solid rubber or other suitable material are also authorized when approved as to type and construction by the Bureau of Explosives.

(b) Steel sheets of specified gauges shall comply with the following:

Gauge No.	Nominal thickness ¹ (inch)	Minimum thickness ¹ (inch)
12.....	0.1046	0.0946
13.....	.0897	.0817
14.....	.0747	.0677
16.....	.0598	.0533

¹ Thickness shall be measured at any point on the sheet not less than ½ inch from an edge.

§ 178.81-9 Closures.

(a) Adequate to prevent leakage; gasket required. Closure must be of screw-thread type or fastened by screw-thread device. Unthreaded cap is authorized for containers of 12 gallons or less if cap is provided with outside sealing devices which cannot be removed without destroying the cap or sealing device.

(b) Closing part (plug, cap, plate, etc., see Note 1) must be of metal as thick as prescribed for head of container; this not required for containers of 12 gallons or less when the opening to be closed is not over 2.3 inches in diameter.

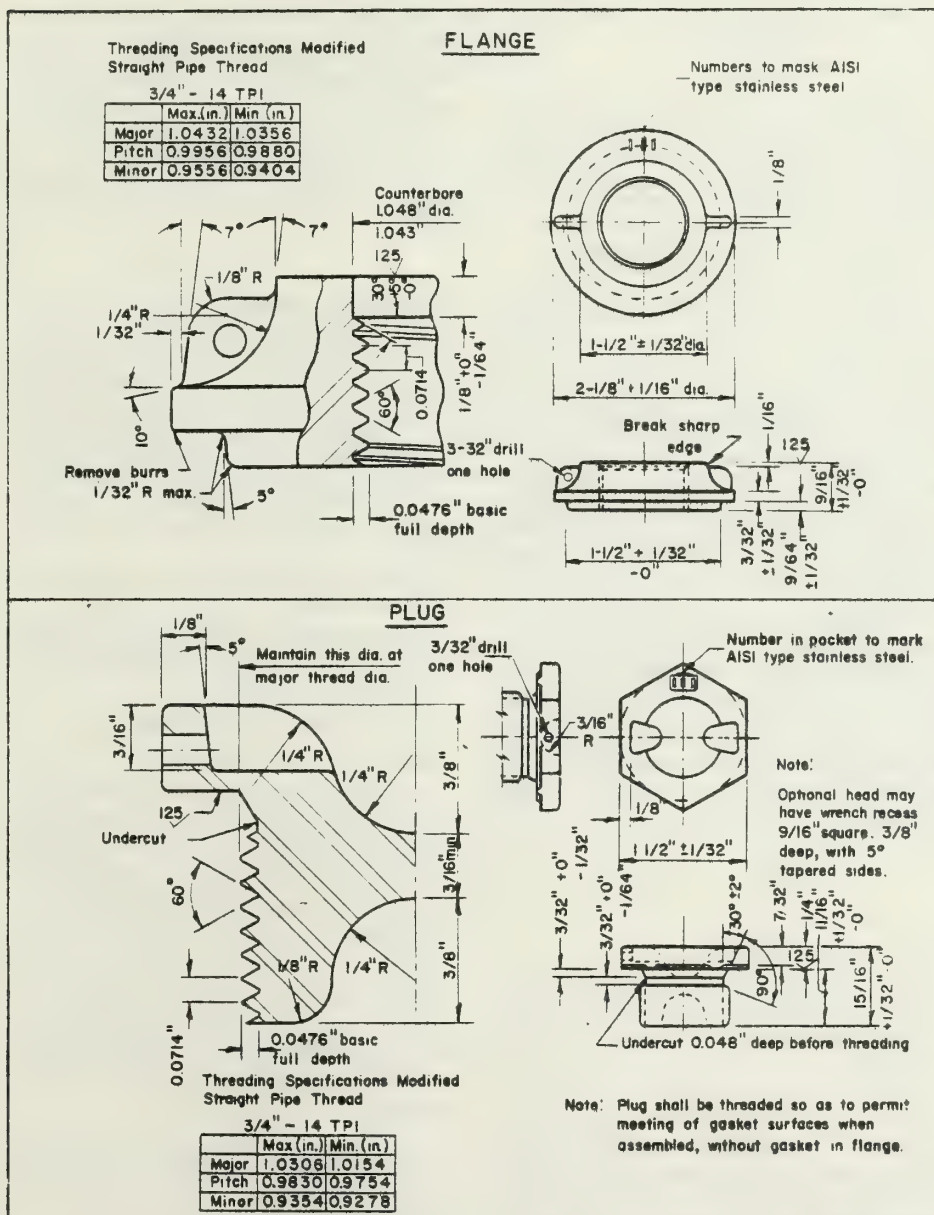
NOTE 1: This does not apply to cap seal over a closure which complies with all requirements.

(c) For closure with threaded plug or cap, the seat (flange, etc.) for plug, or cap must have 5 or more complete threads; 2 drainage holes of not over ⅝" diameter are allowed in that sec-

§ 178.81-8 Rolling hoops.

(a) Separate hoops to have tight fit on shell and be firmly secured in place. Beading under rolling hoops or welding of the rolling hoops directly to the body of the drum in any manner is not permitted.

(1)



(e) Other threaded closures may be authorized upon demonstration of equal efficiency.

§ 178.81-10 Defective containers.

(a) Leaks and other defects to be repaired by method used in constructing container, not by soldering.

§ 178.81-11 Marking.

(a) Marking on each container by embossing on head with raised marks, or by embossing or die stamping on footring on drums equipped with footrings, or on metal plates securely attached to drum by brazing or welding not less than 20 percent of the perimeter as follows:

(1) DOT-5A. In addition, when the container is of stainless steel, the type of steel used in body and head sheets as identified by American Iron and Steel Institute type number, and also the letters HT following steel designation on containers subjected to stress relieving or heat treatment during manufacture (for example, DOT-5A-304 or DOT-5A-304 HT as applicable), shall be shown.

(2) Name or symbol of person making the marks specified in paragraph (a) (1) of this section. Symbol, if used, must be registered with the Bureau of Explosives.

(3) Gauge of metal in thinnest part, rated capacity in gallons, and year of manufacture (for example, 14-55-50). When gauge of metal in body differs from that in head, both must be indicated with slanting line between and with gauge of body indicated first (for example 14/12-55-50 for body 14 gauge and head 12 gauge).

§ 178.81-12 Size of markings.

(a) Size of markings (minimum): $\frac{1}{2}$ " high for 33-gallon or less, $\frac{3}{4}$ " for over 33 and not over 55 gallons, and 1" for over 55 gallons.

§ 178.81-13 Type tests.

(a) Samples taken at random and closed as for use, shall withstand prescribed tests without leakage. Tests to be made of each type and size by each company starting production and to be repeated every 4 months. Samples last tested to be retained until further tests are made or for 1 year, whichever period is shorter. The type tests are as follows:

(1) Test by dropping, filled with water to 98 percent capacity, from height of

6 feet onto solid concrete so as to strike diagonally on chime, or when without chime seam, to strike on other circumferential seam; also additional drop test on any other parts which might be considered weaker than the chime. Closing devices and other parts projecting beyond chime or rolling hoops must also be capable of withstanding this test.

(2) Hydrostatic pressure test of 80 pounds per square inch sustained for 5 minutes.

§ 178.81-14 Leakage test.

(a) Each container shall be tested, with seams under water or covered with soapsuds or heavy oil, by interior air pressure of at least 15 pounds per square inch. Equally efficient means of testing are authorized upon demonstration and proof of satisfactory tests to representative of Bureau of Explosives. Leakers shall be rejected or repaired and re-tested.

§ 178.82 Specification 5B; steel barrels or drums.

Removable head containers which will pass all required tests are authorized.

§ 178.82-1 Compliance.

(a) Required in all details.

§ 178.82-2 Rated capacity.

(a) Rated capacity as marked, see § 178.82-11(a)(3). Minimum actual capacity of containers shall be not less than rated (marked) capacity plus 4 percent. Maximum actual capacity shall not be greater than rated (marked) capacity plus 5 percent or rated (marked) capacity plus 4 percent plus 1 quart whichever is the greater. Actual capacity of bilge type containers must be not less than rated (marked) capacity, nor greater than rated (marked) capacity plus 2 percent plus 2 quarts.

§ 178.82-3 Composition.

(a) Sheets for body and heads to be low carbon, open hearth or electric steel.

§ 178.82-5 Seams.

(a) Body seams welded.

§ 178.82-6 Chime reinforcement.

(a) Containers over 25 gallons capacity, with flanged head secured to body, to have chime reinforcement adequate for its protection.

§ 178.82-7 Parts and dimensions.

(a) Parts and dimensions as follows:

Marked capacity not over (gallons)	Type of container	Minimum thickness, uncoated sheets (gauge)		Rolling hoops		
		Body sheet	Head sheet	Type ¹	Minimum Size (gauge or inch)	Weight (pounds per foot)
5.....	Straight side.....	24	24	None.....		
10.....	do.....	22	22	do.....		
15.....	do.....	20	20	(²).....		
33.....	do.....	18	18	(²).....		
55.....	do.....	16	16	(^{2 3}).....		
110.....	do.....	13	14	(^{2 3}).....		
33.....	Bilge.....	16	16	None.....		
55.....	do.....	14	14	do.....		

¹ Rolling hoops of pliable solid rubber or other suitable material are also authorized when approved as to type and construction by the Bureau of Explosives.

² Rolled or swedged in hoops.

³ Each removable head drum body must have three rolled or swedged in hoops with the center-line of one not more than 3 inches from the top curl.

(b) Steel sheets of specified gauges shall comply with the following:

Gauge No.	Nominal thickness ¹ (inch)	Minimum thickness ¹ (inch)
13.....	0.0897	0.0817
14.....	.0747	.0677
16.....	.0598	.0533
18.....	.0478	.0428
20.....	.0359	.0324
22.....	.0299	.0269
24.....	.0239	.0209

¹ Thickness shall be measured at any point on the sheet not less than $\frac{3}{4}$ inch from an edge.

§ 178.82-8 Rolling hoops.

(a) Separate hoops to have tight fit on shell and be firmly secured in place. Beading under rolling hoops or spot welding not permitted.

§ 178.82-9 Closures.

(a) Adequate to prevent leakage; gaskets required.

(b) Closing part (plug, cap, plate, etc., see Note 1) must be of metal (see paragraph (c) of this section) as thick as prescribed for head of container; this not required for containers of 12 gallons or less when the opening to be closed is not over 2.7 inches in diameter. If unthreaded cap is used it must be provided with outside sealing devices which cannot be removed without destroying the cap or sealing device.

NOTE 1: This does not apply to cap seal over a closure which complies with all requirements.

(c) For closure with threaded plug or cap, the seat (flange, etc.) for plug, or cap, must have 3 or more complete threads; two drainage holes of not over

$\frac{5}{16}$ inch diameter are allowed. Plug, or cap, must have sufficient length of thread to engage 3 threads when screwed home with gasket in place. Closures of screw-thread type or closed by other positive means, of any material or design, may be authorized by the Bureau of Explosives for use, upon satisfactory proof of efficiency.

(d) Full removable head drums over 5 gallons capacity must be closed by means of 12 gauge bolted ring with drop forged lugs, one of which is threaded, and having $\frac{3}{8}$ inch bolt and nut for drums not over 30 gallons capacity and $\frac{3}{4}$ inch bolt and nut for drums over 30 gallons capacity. Five gallon drums must be of lug type closure with cover having at least 16 lugs. Equally efficient types of closures are authorized upon demonstration and proof of satisfactory tests.

§ 178.82-10 Defective containers.

(a) Leaks and other defects to be repaired by method used in constructing container, not by soldering.

§ 178.82-11 Marking.

(a) Marking on each container by embossing on head, except that such embossment must be on the permanent head for drums having removable heads, with raised marks, or by embossing or die stamping on footring on drums equipped with footrings, or on metal plates securely attached to drum by brazing or welding not less than 20 percent of the perimeter, as follows:

(1) DOT-5B. In addition, when the container is of stainless steel, the type of

steel used in body and head sheets as identified by American Iron and Steel Institute type number, and also the letters HT following steel designation on containers subjected to stress relieving or heat treatment during manufacture, (for example, DOT-5B-304, or DOT-5B-304 HT as applicable), shall be shown.

(2) Name or symbol of person making the marks specified in paragraph (a) (1) of this section. Symbol, if used, must be registered with the Bureau of Explosives.

(3) Gauge of metal in thinnest part, rated capacity in gallons, and year of manufacture (for example, 14-55-50). When gauge of metal in body differs from that in the head, both must be indicated with slanting line between and with gauge of body indicated first (for example 14/12-55-50 for body 14 gauge and head 12 gauge).

§ 178.82-12 Size of markings.

(a) Size of markings (minimum): $\frac{1}{2}$ " high for 33-gallon or less, $\frac{3}{4}$ " for over 33 and not over 55 gallons, and 1" for over 55 gallons.

§ 178.82-13 Type tests.

(a) Samples taken at random and closed as for use, shall withstand prescribed tests without leakage. Tests to be made of each type and size by each company starting production and to be repeated every 4 months. Samples last tested to be retained until further tests are made or for 1 year, whichever period is shorter. The type tests are as follows:

(1) Test by dropping, filled with water to 98 percent capacity, from height of 4 feet onto solid concrete so as to strike diagonally on chime, or when without chime seam, to strike on other circumferential seam; also additional drop test on any other parts which might be considered weaker than the chime. Closing devices and other parts projecting beyond chime or rolling hoops must also be capable of withstanding this test.

(2) Hydrostatic pressure tests of 40 pounds per square inch sustained for 5 minutes; except that full removable head drums must sustain 20 pounds per square inch.

§ 178.82-14 Leakage test.

(a) Each container shall be tested, with seams under water or covered with soapsuds or heavy oil, by interior air pressure of at least 15 pounds per square inch. Equally efficient means of testing are authorized upon demonstration and proof of satisfactory tests to representative of Bureau of Explosives. Leakers shall be rejected or repaired and retested. Removable head containers not required to be tested with heads in place except that samples taken at random and closed as for use of each type and size, must be tested at start of production and repeated every 4 months. Samples last tested to be retained until further tests are made or for 1 year, whichever period is shorter.

§ 178.83 Specification 5C; steel barrels or drums.

Removable head containers not authorized.

§ 178.83-1 Compliance.

(a) Required in all details.

§ 178.83-2 Rated capacity.

(a) Rated capacity as marked, see § 178.33-11(a)(3). Actual capacity of straight-sided containers shall be not less than rated (marked) capacity plus 2 percent, nor greater than rated capacity plus 2 percent plus 1 quart, except that for containers over 30 gallons marked capacity actual capacity shall be not less than rated capacity plus 2 percent, nor greater than rated capacity plus 2 percent plus 2 quarts; actual capacity of bilge-type containers must be not less than rated capacity; nor greater than rated capacity plus 2 percent plus 2 quarts.

§ 178.83-3 Composition.

(a) Steel must be, except for rolling hoops and chime reinforcement, as follows:

(b) All sheet metal, welding rod, closing devices, and samples taken from the welded portion of the finished container must be of Type 304, 18 chrome 8 nickel alloy with 0.08 percent chromium, 8-11 percent nickel, or other types of stainless steel of equivalent corrosion resistance and physical properties.

(c) Type 304 or other grades of equivalent corrosion resistant steels in the as-welded condition are permissible for nitric acid concentrations up to and

including 78 percent. For all concentrations of nitric acid the following are permissible:

(1) Type 304 heat-treated (quenches from 1900° F.), or

(2) Stabilized Type 347 in the as-welded condition, or

(3) Stabilized Type 347 stress-relieved (1550°–1650° F.), or

(4) Stabilized Type 347 heat-treated (quenches from 1900° F.), or

(5) Other grades of equivalent corrosion resistance.

(d) All parts of any completed container exposed to lading must comply with the standard 65 percent boiling nitric acid test in that the limit of inches per month penetration in accordance with corrosion test as used in American

Society of Testing Materials Standard A-262-44-T shall be 0.0015 inch, this figure to be an average of five 48-hour tests.

§ 178.83-5 Seams.

(a) Body seams welded.

(b) Chime seams welded or double-seamed and welded.

(c) Flanges for closures welded in place.

§ 178.83-6 Chime reinforcement.

(a) Containers of 10 gallons capacity or over, with flanged head secured to body, to have chime reinforcement adequate for its protection.

§ 178.83-7 Parts and dimensions.

(a) Parts and dimensions as follows:

Marked capacity not over (gallons)	Type of container	Minimum thickness, uncoated sheets (gauge)		Rolling hoops		
		Body sheet	Head sheet	Type ¹	Minimum	
					Size (gauge or inch)	Weight (pounds per foot)
15	Straight side	20	20	None		
30	do	18	18	I-bar	$\frac{1}{2} \times 1\frac{1}{4}$	1.25
55	do	16	16	I-bar ²	do.	1.60
110	do	14	14	do. ²	do.	1.60
15	Bilge	16	16	None		
20	do	14	16	do.		
65	do	13	14	do.		

¹ Rolling hoops of pliable solid rubber or other suitable material are also authorized when approved as to type and construction by the Bureau of Explosives.

² Stainless steel I-bar rolling hoops $\frac{3}{4} \times 1\frac{1}{4}$ inches, weighing not less than 1.27 pounds per foot, are authorized.

(b) Steel sheets of specified gauges shall comply with the following:

Gauge No.	Nominal thickness ¹ (inch)	Minimum thickness ¹ (inch)
13	0.0897	0.0817
14	.0747	.0677
16	.0598	.0533
18	.0478	.0428
20	.0359	.0324

¹ Thickness shall be measured at any point on the sheet not less than $\frac{3}{8}$ inch from an edge.

for containers of 12 gallons or less if cap is provided with outside sealing devices which cannot be removed without destroying the cap or sealing device.

(b) Closing part (plug, cap, plate, etc., see Note 1) must be of metal as thick as prescribed for head of container; this not required for containers of 12 gallons or less when the opening to be closed is not over 2.3 inches in diameter.

NOTE 1: This does not apply to cap seal over a closure which complies with all requirements.

(c) For closure with threaded plug or cap, the seat (flange, etc.) for plug or cap must have 5 or more complete threads; 2 drainage holes of not over $\frac{5}{16}$ inch diameter are allowed in that section of flange which extends inside the drum. Plug or cap must have sufficient length of thread to engage 5 threads when securely tightened with gasket in place. Except that for containers not over 15 gallons marked capacity the seat (flange, etc.) for plug or cap may have at least 3 complete threads and plug or cap sufficient length of thread to engage 3 threads

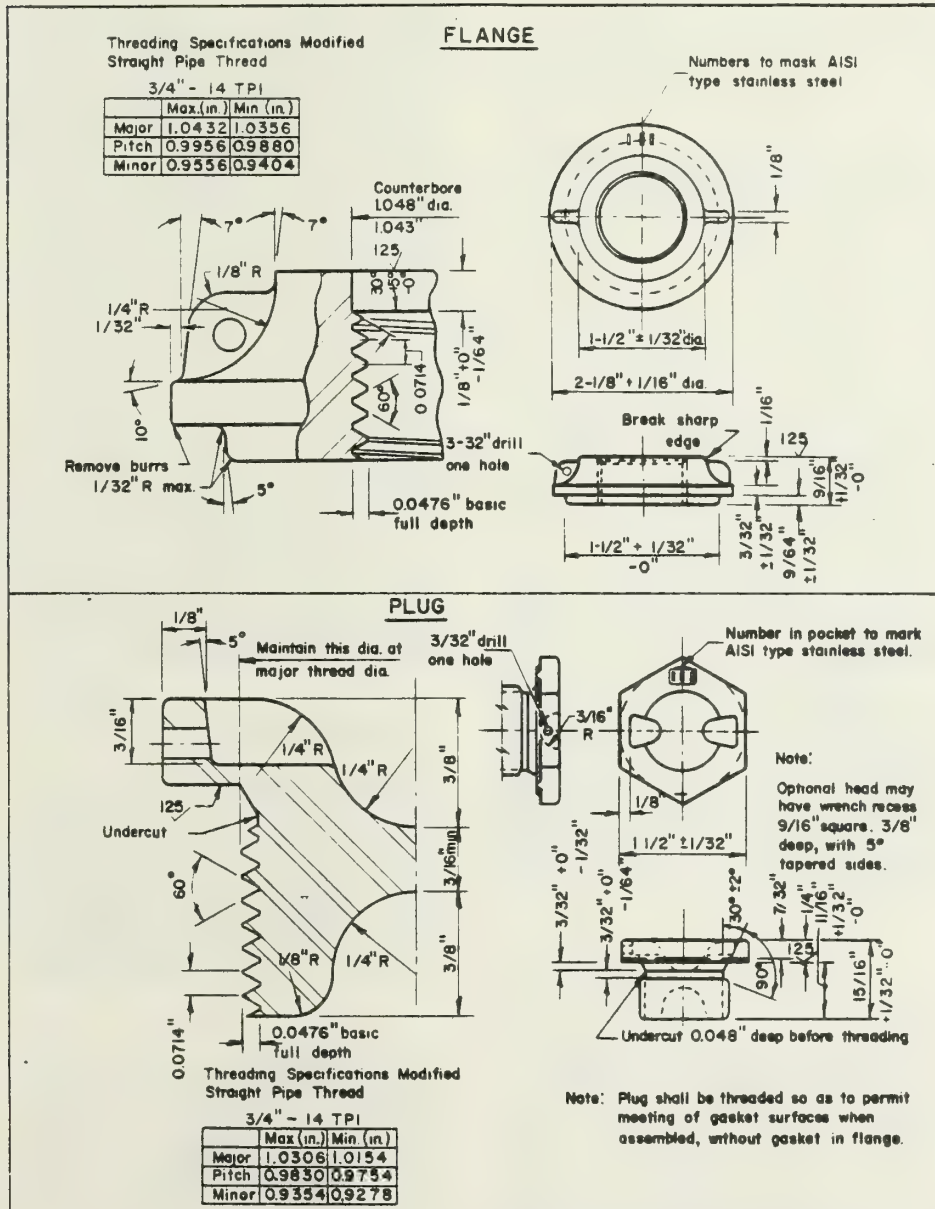
§ 178.83-8 Rolling hoops.

(a) Separate hoops to have tight fit on shell and be firmly secured in place. Beading under rolling hoops or spot welding not permitted.

§ 178.83-9 Closures.

(a) Adequate to prevent leakage; gaskets required. Closure must be of screw-thread type or fastened by screw-thread device. Unthreaded cap is authorized

(3)



(e) Other threaded closures may be authorized upon demonstration of equal efficiency.

§ 178.83-10 Defective containers.

(a) Leaks and other defects to be repaired by method used in constructing container, not by soldering.

§ 178.83-11 Marking.

(a) Marking on each container by embossing on head with raised marks, or by embossing or die stamping on foot-ring on drums equipped with foot-rings, or on metal plates securely attached to drum by brazing or welding not less than 20 percent of the perimeter as follows:

(1) DOT-5C, the type of steel used in body and head sheets as identified by American Iron and Steel Institute type number, and, in addition, the letters HT following steel designation on containers subjected to stress relieving or heat treatment during manufacture (for example, DOT-5C-304 or DOT-5C-304HT as applicable).

(2) Name or symbol of person making the marks specified in paragraph (a) (1) of this section. Symbol, if used, must be registered with the Bureau of Explosives.

(3) Gauge of metal in thinnest part, rated capacity in gallons, and year of manufacture (for example, 14-55-50). When gauge of metal in body differs from that in head, both must be indicated with slanting line between and with gauge of body indicated first (for example 14/12-55-50 for body 14 gauge and head 12 gauge).

§ 178.83-12 Size of marking.

(a) Size of markings (minimum): $\frac{1}{2}$ " high for 33-gallon or less, $\frac{3}{4}$ " for over 33 and not over 55 gallons, and 1" for over 55 gallons.

§ 178.83-13 Type tests.

(a) Samples, taken at random and closed as for use, must be capable of withstanding prescribed tests without leakage. Tests to be made of each type and size by each company starting production and to be repeated every 4 months, except as provided in subparagraph (3) of this

paragraph. Samples last tested to be retained until further tests are made or for one year, whichever period is shorter. The type tests are as follows:

(1) Test by dropping, filled with water to 98 percent capacity, from height of 6 feet onto solid concrete so as to strike diagonally on chime, or when without chime seam, to strike on other circumferential seam; also additional drop test on any other parts which might be considered weaker than the chime. Closing devices and other parts projecting beyond chime or rolling hoops must also be capable of withstanding this test.

(2) Hydrostatic pressure test of 80 pounds per square inch sustained for 5 minutes.

(3) Periodic drop and hydrostatic tests are not required where container has satisfactorily met prescribed tests at the original start of production. Satisfactory test results must be obtained on samples of subsequent containers that have been altered in design or construction. Samples so tested must be retained until further tests are made or for one year, whichever period is shorter.

§ 178.83-14 Leakage test.

(a) Each container shall be tested, with seams under water or covered with soapsuds or heavy oil, by interior air pressure of at least 15 pounds per square inch. Equally efficient means of testing are authorized upon demonstration and proof of satisfactory test. Leakers shall be rejected or repaired and retested.

§ 178.84 Specification 5D; steel barrels or drums, lined.

Removable head containers which will pass all required tests are authorized.

§ 178.84-1 Compliance.

(a) Required in all details.

§ 178.84-2 Rated capacity.

(a) Rated capacity as marked, see § 178.84-11(a)(3). Actual capacity of straight-sided containers shall be not less than rated (marked) capacity plus 2 percent, nor greater than rated capac-

ity plus 2 percent plus 1 quart, except that for containers over 30 gallons marked capacity actual capacity shall be not less than rated capacity plus 2 percent, nor greater than rated capacity plus 2 percent plus 2 quarts; actual capacity of bilge-type containers must be not less than rated capacity, nor greater than rated capacity plus 2 percent plus 2 quarts.

§ 178.84-3 Composition.

(a) Sheets for body and heads to be low carbon, open hearth or electric steel.

§ 178.84-5 Lining.

(a) To be applied so as to adhere securely to metal throughout; to be tough and pliable. Hard rubber authorized to line closing devices.

§ 178.84-6 Chime reinforcement.

(a) Containers over 25 gallons capacity, with flanged head secured to body, to have chime reinforcement adequate for its protection.

§ 178.84-7 Parts and dimensions.

(a) Parts and dimensions as follows:

Marked capacity not over (gallons)	Type of container	Minimum thickness, uncoated sheets (gauge)		Rolling hoops		
		Body sheet	Head sheet	Type ¹	Minimum	
					Size (gauge or inch)	Weight (pounds per foot)
10.....	Straight side.....	16	16	None.....		
30.....	do.....	16	16	I-bar.....	$\frac{3}{4} \times 1\frac{1}{4}$	1.25
55.....	do.....	14	14	I-bar.....	$\frac{3}{4} \times 1\frac{1}{4}$	1.60
110.....	do.....	12	12	do.....	do.....	1.60
30.....	Bilge.....	14	16	None.....		
55.....	do.....	13	11	do.....		

¹ Rolling hoops of pliable solid rubber or other suitable material are also authorized when approved as to type and construction by the Bureau of Explosives.

(b) Steel sheets of specified gauges shall comply with the following:

Gauge No.	Nominal thickness ¹ (inch)	Minimum thickness ¹ (inch)
12.....	0.1046	0.0946
13.....	.0897	.0817
14.....	.0747	.0677
16.....	.0598	.0533

¹ Thickness shall be measured at any point on the sheet not less than $\frac{3}{8}$ inch from an edge.

thick as prescribed for head of container; this not required for containers of 12 gallons or less when the opening to be closed is not over 2.3 inches in diameter. If unthreaded cap is used it must be provided with outside sealing devices which cannot be removed without destroying the cap or sealing device.

NOTE 1: This does not apply to cap seal over a closure which complies with all requirements.

(c) For closure with threaded plug or cap, the seat (flange, etc.) for plug, or cap, must have 5 or more complete threads; two drainage holes of not over $\frac{3}{16}$ " diameter are allowed. Plug, or cap, must have sufficient length of thread to engage 5 threads when screwed home with gasket in place.

(d) Closure must be of screw-thread type or fastened by screw-thread device.

§ 178.84-10 Defective containers.

(a) Leaks and other defects to be repaired by method used in constructing container, not by soldering.

§ 178.84-8 Rolling hoops.

(a) Separate hoops to have tight fit on shell and be firmly secured in place. Beading under rolling hoops or spot welding not permitted.

§ 178.84-9 Closures.

(a) Adequate to prevent leakage; gas-kets required.

(b) Closing part (plug, cap, plate, etc., see Note 1) must be of metal as

§ 178.84-11 Marking.

(a) Marking on each container by embossing on head, except that such embossment must be on the permanent head for drums having removable heads, with raised marks, or by embossing or die stamping on footring on drums equipped with footrings, or on metal plates securely attached to drum by brazing or welding not less than 20 percent of the perimeter, as follows:

(1) DOT-5D. In addition, when the container is of stainless steel, the type of steel used in body and head sheets as identified by American Iron and Steel Institute type number, and also the letters HT following steel designation on containers subjected to stress relieving or heat treatment during manufacture (for example, DOT-5D-304 or DOT-5D-304 HT as applicable), shall be shown.

(2) Name or symbol of person making the marks specified in paragraph (a) (1) of this section. Symbol, if used, must be registered with the Bureau of Explosives.

(3) Gauge of metal in thinnest part, rated capacity in gallons, and year of manufacture (for example, 14-55-50). When gauge of metal in body differs from that in head, both must be indicated with slanting line between and with gauge of body indicated first (for example 14/22-55-50 for body 14 gauge and head 12 gauge).

§ 178.84-12 Size of markings.

(a) Size of markings (minimum): $\frac{1}{2}$ " high for 33-gallon or less, $\frac{3}{4}$ " for over 33 and not over 55 gallons, and 1" for over 55 gallons.

§ 178.84-13 Type tests.

(a) Sample containers, before lining is applied, taken at random and closed as for use, must be capable of withstanding prescribed tests without leakage.

(b) Tests to be made of each type and size by each company starting production and to be repeated every 4 months, except as provided in subparagraph (3) of this paragraph. Samples last tested to be retained until further tests are made

or for 1 year, whichever period is shorter. The type tests are as follows:

(1) Test by dropping, filled with water to 98 percent capacity, from height of 6 feet onto solid concrete so as to strike diagonally on chime, or when without chime seam, to strike on other circumferential seam; also additional drop test on any other parts which might be considered weaker than the chime. Closing devices and other parts projecting beyond chime or rolling hoops must also be capable of withstanding this test.

(2) Hydrostatic pressure test of 80 pounds per square inch sustained for 5 minutes.

(3) Periodic drop and hydrostatic tests are not required where container has satisfactorily met prescribed tests at the original start of production. Satisfactory test results must be obtained on samples of subsequent containers that have been altered in design or construction. Samples so tested must be retained until further tests are made or for 1 year, whichever period is shorter.

§ 178.84-14 Leakage test.

(a) Each container, with lining material applied, shall be tested, with seams under water or covered with soapsuds or heavy oil, by interior air pressure of at least 15 pounds per square inch. Equally efficient means of testing are authorized upon demonstration and proof of satisfactory tests. Leakers shall be rejected or repaired and retested. Removable head containers not required to be tested with heads in place except that samples taken at random and closed as for use, of each type and size, must be tested at start of production and repeated every 4 months. Samples last tested to be retained until further tests are made or for 1 year, whichever period is shorter.

§ 178.84-15 Additional test.

(a) On each container by 110-volt electrical circuit between inside and outside of container filled with suitable electrolyte; a milliammeter must show zero reading. The milliammeter test is required when retesting containers which show evidence of damage. A spark coil

test is permitted on each container during manufacture in lieu of the milliammeter test described above.

§ 178.85 Specification 5F; steel drums.

Removable head containers not authorized.

§ 178.85-1 Compliance.

(a) Required in all details.

§ 178.85-2 Rated capacity.

(a) Rated capacity as marked, see § 178.85-10(a)(3): Not over 11 gallons.

§ 178.85-3 Composition.

(a) Sheets for body and heads to be low carbon, open hearth or electric steel.

§ 178.85-5 Seams.

(a) Body seams welded or brazed.

(b) Head and chime seams welded or brazed.

(c) Flanges for closures welded or brazed in place.

§ 178.85-6 Chime reinforcement.

(a) Container to have chime reinforcement adequate for its protection.

§ 178.85-7 Gauge and thickness of sheets.

(a) Body and heads shall be of uncoated steel sheets having nominal thickness of 0.0747 inch and minimum thickness of 0.0677 inch, which sheets shall be designated 14 gauge.

§ 178.85-8 Closures required.

(a) Of screw-thread type and adequate to prevent leakage in transit. Openings over 2.3" diameter not permitted. Threads for connections (valve, bung, etc.) to be American Standard taper pipe threads, tapped to gauge, and clean cut to insure tight joints.

§ 178.85-9 Defective containers.

(a) Leaks and other defects to be repaired by method used in constructing container, not by soldering.

§ 178.85-10 Marking.

(a) Marking on each container by embossing on head with raised marks, or by embossing or die stamping on footring on drums equipped with footrings, or on metal plates securely attached to drum by brazing or welding not less than 20

percent of the plates perimeter, as follows:

(1) DOT-5F.

(2) Name or symbol of person making the mark specified in paragraph (a)(1) of this section. Symbol, if used, must be registered with the Bureau of Explosives.

(3) Serial number and name or symbol of company or person for whose use the container is made.

(4) Gauge of metal in thinnest part, rated capacity in gallons, and year of manufacture (for example 14-11-50). When gauge of metal in body differs from that in head, both must be indicated with slanting line between and with gauge of body indicated first (for example, 14/12-11-50 for body 14 gauge and head 12 gauge).

§ 178.85-11 Size of markings.

(a) Size of markings (minimum): $\frac{1}{2}$ " high.

§ 178.85-12 Type tests.

(a) Samples taken at random and closed as for use, shall withstand prescribed tests without leakage. Tests to be made of each type and size by each company starting production and to be repeated every 4 months. Samples last tested to be retained until further tests are made or for 1 year, whichever period is shorter. The type tests are as follows:

(1) Test by dropping, filled with water to 98 percent capacity, from height of 6 feet onto solid concrete so as to strike diagonally on chime, or when without chime seam, to strike on other circumferential seam; also additional drop test on any other parts which might be considered weaker than the chime. Closing devices and other parts projecting beyond chime or rolling hoops must also be capable of withstanding this test.

(2) Hydrostatic pressure test of 125 pounds per square inch sustained for 5 minutes.

§ 178.85-13 Leakage test.

(a) Each container shall be tested, with seams under water or covered with soapsuds or heavy oil, by interior air pressure of at least 100 pounds per square inch. Equally efficient means of testing are authorized upon demonstration and

proof of satisfactory test. Leakers shall be rejected or repaired and retested.

§ 178.87 Specification 5H; steel barrels or drums, lead lined.

Removable head containers not authorized.

§ 178.87-1 Compliance.

(a) Required in all details.

§ 178.87-2 Rated capacity.

(a) Rated capacity as marked, see § 178.87-11(a)(3). Actual capacity of straight-sided containers shall be not less than rated (marked) capacity plus 2 percent, nor greater than rated capacity plus 2 percent plus 1 quart, except that for containers over 30 gallons marked capacity actual capacity shall be not less than rated capacity plus 2 percent, nor greater than

rated capacity plus 2 percent plus 2 quarts; actual capacity of bilge-type containers must be not less than rated capacity, nor greater than rated capacity plus 2 percent plus 2 quarts.

§ 178.87-3 Composition.

(a) Sheets for body and heads to be low carbon, open hearth or electric steel.

§ 178.87-5 Seams.

(a) Body seams welded.

(b) Head and chime seams welded or double-seamed.

(c) Flanges for closures welded in place.

§ 178.87-6 Chime reinforcement.

(a) Containers with flanged head secured to body to have chime reinforcement adequate for its protection.

§ 178.87-7 Parts and dimensions.

(a) Parts and dimensions as follows:

Marked capacity not over (gallons)	Type of container	Minimum thickness, uncoated sheets (gauge)		Rolling hoops		
		Body sheet	Head sheet	Type ¹	Minimum	
					Size (gauge or inch)	Weight (pounds per foot)
10.....	Straight side.....	16	16	None.....		
30.....	do.....	16	16	I-bar.....	$\frac{3}{4} \times 1\frac{1}{4}$	1.25
55.....	do.....	14	14	do.....	do.....	1.80
110.....	do.....	12	12	do.....	do.....	1.60
30.....	Bilge.....	14	16	None.....	do.....	
55.....	do.....	13	14	do.....	do.....	

¹ Rolling hoops of pliable solid rubber or other suitable material are also authorized when approved as to type and construction by the Bureau of Explosives.

(b) Steel sheets of specified gauges shall comply with the following:

Gauge No.	Nominal thickness ¹ (inch)	Minimum thickness ¹ (inch)
12.....	0.1046	0.0946
13.....	.0897	.0817
14.....	.0747	.0677
16.....	.0598	.0533

¹ Thickness shall be measured at any point on the sheet not less than $\frac{3}{4}$ inch from an edge.

(c) Lining required: Of lead, at least $\frac{3}{32}$ " thick, completely bonded to the steel.

§ 178.87-8 Rolling hoops.

(a) Separate hoops to have tight fit on shell and be firmly secured in place. Beading under rolling hoops or spot welding not permitted.

§ 178.87-9 Closures.

(a) Adequate to prevent leakage; gas-kets required. Closure must be of screw-thread type or fastened by screw-thread device. Unthreaded cap is authorized for containers of 12 gallons or less if cap is provided with outside sealing devices which cannot be removed without destroying the cap or sealing device.

(b) Closing part (plug, cap, plate, etc., see Note 1) must be of metal as thick as prescribed for head of container; this not required for containers of 12 gallons

or less when the opening to be closed is not over 2.3 inches in diameter.

NOTE 1: This does not apply to cap seal over a closure which complies with all requirements.

(c) For closures with threaded plug or cap, the seat (flange, etc.) for plug, or cap, must have 5 or more complete threads; two drainage holes of not over $\frac{5}{16}$ " diameter are allowed. Plug, or cap, must have sufficient length of thread to engage 5 threads when screwed home with gasket in place.

(d) Openings over 2.3" diameter not permitted. Threads for plug or cap must be 8 or less per inch when over $\frac{3}{4}$ " standard pipe size.

§ 178.87-10 Defective containers.

(a) Leaks and other defects to be repaired by method used in constructing container, not by soldering.

§ 178.87-11 Marking.

(a) Marking on each container by embossing on head with raised marks, or by embossing or die stamping on footring on drums equipped with footrings, or on metal plates securely attached to drum by brazing or welding not less than 20 percent of the perimeter as follows:

(1) DOT-5H. In addition, when the container is of stainless steel, the type of steel used in body and head sheets as identified by American Iron and Steel Institute type number, and also the letters HT following steel designation on containers subjected to stress relieving or heat treatment during manufacture, (for example, DOT-5H-304 or DOT-5H-304 HT as applicable), shall be shown.

(2) Name or symbol of person making the marks specified in paragraph (a) (1) of this section. Symbol, if used, must be registered with the Bureau of Explosives.

(3) Gauge of metal in thinnest part, rated capacity in gallons, and year of manufacture (for example, 14-55-50). When gauge of metal in body differs from that in head, both must be indicated with slanting line between and with gauge of body indicated first (for example 14/12-55-50 for body 14 gauge and head 12 gauge).

§ 178.87-12 Size of marking.

(a) Size of marking (minimum): $\frac{1}{2}$ " high for 33-gallon or less, $\frac{3}{4}$ " for over 33 and not over 55 gallons, and 1" for over 55 gallons.

§ 178.87-13 Type tests.

(a) Samples taken at random and closed as for use, shall withstand prescribed tests without leakage. Tests to be made of each type and size by each company starting production and to be repeated every 4 months. Samples last tested to be retained until further tests are made or for 1 year, whichever period is shorter. The type tests are as follows:

(1) Test by dropping, filled with water to 98 percent capacity, from height of 6 feet onto solid concrete so as to strike diagonally on chime, or when without chime seam, to strike on other circumferential seam, also additional drop test on any other parts which might be considered weaker than the chime. Closing devices and other parts projecting beyond chime or rolling hoops must also be capable of withstanding this test.

(2) Hydrostatic pressure test of 80 pounds per square inch sustained for 5 minutes.

(3) Periodic drop tests will not be required after initial drop tests at start of manufacture, on containers of a construction in excess of minimum specification requirements.

§ 178.87-14 Leakage test.

(a) Each container shall be tested, with seams under water or covered with soapsuds or heavy oil, by interior air pressure of at least 15 pounds per square inch. Equally efficient means of testing are authorized upon demonstration and proof of satisfactory tests. Leakers shall be rejected or repaired and retested.

§ 178.88 Specification 5K; nickel barrels or drums.

Removable head containers not authorized.

§ 178.88-1 Compliance.

(a) Required in all details.

§ 178.88-2 Rated capacity.

(a) Rated capacity as marked, see § 178.88-10(a)(3). Actual capacity of straight-sided containers shall be not less than rated (marked) capacity plus 2 percent, nor greater than rated capacity plus 2 percent plus 1 quart, except that for containers over 30 gallons marked capacity actual capacity shall be not less than rated capacity plus 2 percent, nor greater than rated capacity plus 2 percent plus 2 quarts; actual capacity of bilge-type containers must be not less than rated capacity, nor greater than rated capacity plus 2 percent plus 2 quarts.

§ 178.88-3 Composition.

(a) Material must be, except for rolling hoops and chime reinforcements, nickel at least 99.0 percent pure.

§ 178.88-4 Seams.

(a) Body seams welded.

(b) Head and chime seams welded or double-seamed.

(c) Flanges for closures welded in place.

§ 178.88-5 Chime reinforcement.

(a) Containers over 25 gallons capacity with flanged head secured to body, to have chime reinforcement adequate for its protection.

§ 178.88-6 Parts and dimensions.

(a) Parts and dimensions as follows:

Marked capacity not over (gallons)	Type of container	Minimum thickness in the blank (gauge, United States stand- ard)		Rolling hoops		
		Body sheet	Head sheet	Type ¹	Minimum	
					Size (gauge or inch)	Weight (pounds per foot)
10.....	Straight side.....	16	16	None.....		
30.....	do.....	16	16	I-bar.....	$\frac{3}{4} \times 1\frac{1}{4}$	1.25
55.....	do.....	14	14	do.....	do.....	1.60
110.....	do.....	12	12	do.....	do.....	1.60
30.....	Bilge.....	14	16	None.....		
55.....	do.....	13	14	do.....		

¹ Rolling hoops of pliable solid rubber or other suitable material are also authorized when approved as to type and construction by the Bureau of Explosives.

§ 178.88-7 Rolling hoops.

(a) Separate hoops to have tight fit on shell and be firmly secured in place. Beading under rolling hoops or spot welding not permitted.

§ 178.88-8 Closures.

(a) Adequate to prevent leakage; gaskets required. Closure must be of screw-thread type or fastened by screw-thread device. Unthreaded cap is authorized for containers of 12 gallons or less if cap is provided with outside sealing devices which cannot be removed without destroying the cap or sealing device.

(b) Closing part (plug, cap, plate, etc. see Note 1) must be of metal as thick as prescribed for head of container; this not required for containers of 12 gallons or less when the opening to be closed is not over 2.3 inches in diameter.

NOTE 1: This does not apply to cap seal over a closure which complies with all requirements.

(c) For closure with threaded plug or cap, the seat (flange, etc.) for plug or cap must have 5 or more complete threads; 2 drainage holes of not over $\frac{3}{16}$ -inch diameter are allowed in that section of flange which extends inside the drum. Plug or cap must have sufficient length of thread to engage 5 threads when securely tightened with gasket in place.

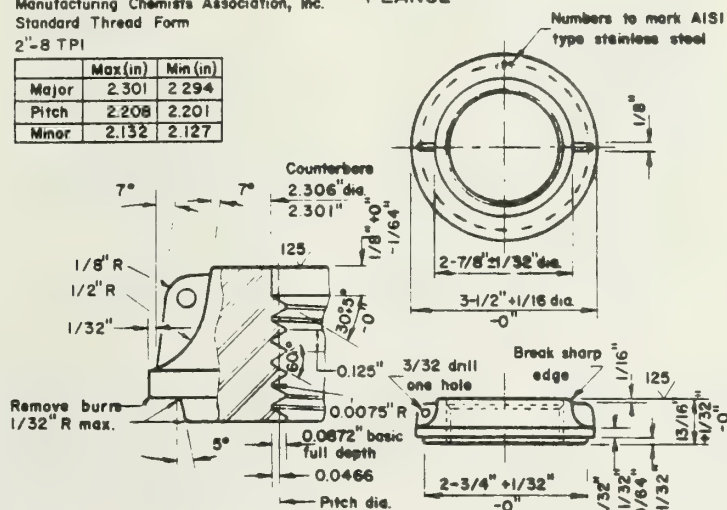
(d) Openings over 2.3 inches in diameter are not permitted. Threads for plug or cap must be 8 or less per inch when over $\frac{3}{4}$ inch standard pipe size.

(1) Flanges with inside threads and plug must conform with the thread diameter and thread form shown in the following drawing (other details shown on the drawing are recommended),

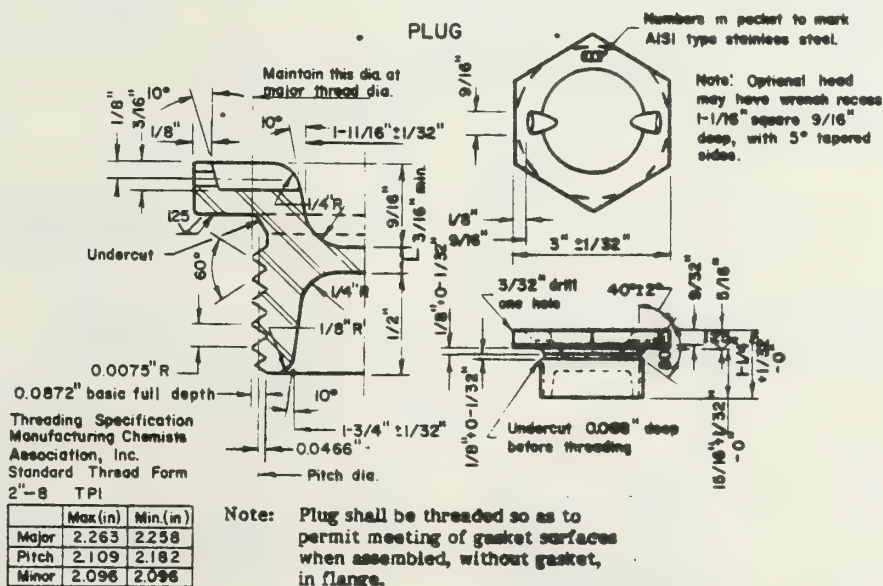
Threading Specifications
Manufacturing Chemists Association, Inc.
Standard Thread Form
2"-8 TPI

	Max (in)	Min (in)
Major	2.301	2.294
Pitch	2.208	2.201
Minor	2.132	2.127

FLANGE



PLUG



or (2) Eleven and one-half (11½) threads per inch, standard pipe size.

§ 178.88-9 Defective containers.

(a) Leaks and other defects to be repaired by method used in constructing container, not by soldering.

§ 178.88-10 Marking.

(a) Marking on each container by embossing on head with raised marks, or by embossing or die stamping on footring on drums equipped with footrings, or on metal plates securely attached to drum by brazing or welding not less than 20 percent of the perimeter as follows:

(1) DOT-5K.

(2) Name or symbol of person making the marks specified in paragraph (a) (1) of this section. Symbol, if used, must be registered with the Bureau of Explosives.

(3) Gauge of metal in thinnest part, rated capacity in gallons, and year of manufacture (for example, 14-55-50). When gauge of metal in body differs from that in head, both must be indicated with slanting line between and with gauge of body indicated first (for example 14/12-55-50 for body 14 gauge and head 12 gauge).

§ 178.88-11 Size of markings.

(a) Size of markings (minimum): $\frac{1}{2}$ " high for 33-gallon or less, $\frac{3}{4}$ " for over 33 and not over 55 gallons, and 1" for over 55 gallons.

§ 178.88-12 Type tests.

(a) Samples, taken at random and closed as for use, must be capable of withstanding prescribed tests without leakage. Tests to be made of each type and size by each company starting production and to be repeated every 12 months, except as provided in subparagraph (3) of this paragraph. Samples last tested to be retained until further tests are made or for 2 years, whichever period is shorter. The type tests are as follows:

(1) Test by dropping, filled with water to 98 percent capacity, from height of 6 feet onto solid concrete so as to strike diagonally on chime, or when without chime seam, to strike on other circumferential seam; also additional drop test of any other parts which might be con-

sidered weaker than the chime. Closing devices and other parts projecting beyond chime or rolling hoops must also be capable of withstanding this test.

(2) Hydrostatic pressure test of 80 pounds per square inch sustained for 5 minutes.

(3) Periodic drop and hydrostatic tests are not required when container has satisfactorily met prescribed tests at the original start of production. Satisfactory test results must be obtained on samples of subsequent containers that have been altered in design or construction. Samples so tested must be retained until further tests are made or for 2 years, whichever period is shorter.

§ 178.88-13 Leakage test.

(a) Each container shall be tested, with seams under water or covered with soapsuds or heavy oil, by interior air pressure of at least 15 pounds per square inch. Equally efficient means of testing are authorized upon demonstration and proof of satisfactory tests. Leakers shall be rejected or repaired and retested.

§ 178.89 Specification 5L; steel barrels or drums.

Removable head containers not authorized.

§ 178.89-1 Compliance.

(a) Required in all details.

§ 178.89-2 Rated capacity.

(a) Rated capacity as marked, see § 178.89-9(a)(3). Actual capacity shall be not less than rated (marked) capacity plus 2 percent, nor greater than rated capacity plus 2 percent plus 1 quart.

§ 178.89-3 Composition.

(a) Sheets for body and heads to be low carbon, open hearth or electric steel.

§ 178.89-5 Seams.

(a) Body seams welded.

(b) Head and chime seams welded or double-seamed.

(c) Flanged spout for filling and emptying container welded in place or attached in a manner approved by Bureau of Explosives.

§ 178.89-6 Parts and dimensions.

(a) Parts and dimensions as follows:

Marked capacity not over (gallons)	Type of container	Minimum thickness, uncoated sheets (gauge)		Rolling hoops		
				Type	Minimum	
		Body sheet	Head sheet		Size (gauge or inch)	Weight (pounds per foot)
5.....	Rectangular.....	20	20	None.....	.....	.....

(b) Steel sheets of specified gauges shall comply with the following:

Gauge No.	Nominal thickness ¹ (inch)	Minimum thickness ¹ (inch)
20.....	0.0359	0.0324

¹ Thickness shall be measured at any point on the sheet not less than $\frac{1}{4}$ inch from an edge.

§ 178.89-7 Closures.

(a) Adequate to prevent leakage; gaskets required.

(b) Closing part must be of sufficient strength to withstand the drop test prescribed in § 178.89-11(a)(1).

(c) Closure must be of screw-thread type or fastened by screw-thread device.

(d) Openings over 2.5 inches diameter not permitted.

§ 178.89-8 Defective containers.

(a) Leaks and other defects to be repaired by method used in constructing container, not by soldering.

§ 178.89-9 Marking.

(a) Marking on each container by embossing on head with raised marks, or by embossing or die stamping on footring on drums equipped with footrings, or on metal plates securely attached to drum by brazing or welding not less than 20 percent of the perimeter as follows:

(1) DOT-5L.

(2) Name or symbol of person making the mark: specified in paragraph (a)(1) of this section. Symbol, if used, must be registered with the Bureau of Explosives.

(3) Gauge of metal in thinnest part, rated capacity in gallons, and year of manufacturer (for example, 20-5-50). When gauge of metal in body differs from that in head, both must be indicated with slanting line between and

with gauge of body indicated first (for example 20/18-5-50 for body 20 gauge and head 18 gauge).

§ 178.89-10 Size of markings.

(a) Size of markings (minimum): $\frac{1}{2}$ " high.

§ 178.89-11 Type tests.

(a) Samples taken at random and closed as for use, shall withstand prescribed tests without leakage. Tests to be made of each type and size by each company starting production and to be repeated every 4 months. Samples last tested to be retained until further tests are made or for 1 year, whichever period is shorter. The type tests are as follows:

(1) Test by dropping, filled with water to 98 percent capacity, from height of 6 feet onto solid concrete so as to strike diagonally on chime, or when without chime seam, to strike on other circumferential seam; also additional drop test on any other parts which might be considered weaker than the chime. Closing devices and other parts projecting beyond chime or rolling hoops must also be capable of withstanding this test.

(2) Hydrostatic pressure test of 15 pounds per square inch sustained for 5 minutes.

§ 178.89-12 Leakage test.

(a) Each container shall be tested, with seams under water or covered with soapsuds or heavy oil, by interior air pressure of at least 5 pounds per square inch. Equally efficient means of testing are authorized upon demonstration and

proof of satisfactory tests. Leakers shall be rejected or repaired and retested.

§ 178.90 Specification 5M; monel drums.

Removable head containers not authorized.

§ 178.90-1 Compliance.

(a) Required in all details.

§ 178.90-2 Rated capacity.

(a) Rated capacity as marked, see § 178.90-10(a)(3). Actual capacity of containers shall be not less than rated (marked) capacity plus 2 percent, nor greater than rated capacity plus 2 percent plus 1 quart, except that for containers over 30 gallons marked capacity actual capacity shall be not less than rated capacity plus 2 percent, nor greater

than rated capacity plus 2 percent plus 2 quarts.

§ 178.90-3 Composition.

(a) Material must be, except for rolling hoops and chime reinforcements monel.

§ 178.90-4 Seams.

(a) Body seams welded.

(b) Head and chime seams welded or double-seamed.

(c) Flanges for closures welded in place.

§ 178.90-5 Chime reinforcement.

(a) Containers to have chime reinforcement adequate for its protection.

§ 178.90-6 Parts and dimensions.

(a) Parts and dimensions as follows:

Marked capacity not over (gallons)	Type of container	Minimum thickness in the blank (gauge, United States stand- ard)		Rolling hoops		
				Type ¹	Minimum	
		Body sheet	Head sheet		Size (gauge or inch)	Weight (pounds per foot)
10.....	Straight side.....	14	14	None.....		
55.....	do.....	14	14	I-bar.....	$\frac{3}{4} \times 1\frac{1}{4}$	1.60

¹ Rolling hoops of pliable solid rubber or other suitable material are also authorized when approved as to type and construction by the Bureau of Explosives.

§ 178.90-7 Rolling hoops.

(a) Separate hoops if used, to have tight fit on shell and be firmly secured in place. Beading under rolling hoops or spot welding not permitted.

§ 178.90-8 Closures.

(a) Adequate to prevent leakage. Closure must be of screw-thread type or fastened by screw-thread device. Unthreaded cap is authorized for containers of 12 gallons or less if cap is provided with outside sealing devices which cannot be removed without destroying the cap or sealing device.

(b) Closing part (plug, cap, plate, etc., see Note 1) must be of metal as thick as prescribed for head of container; this not required for containers of 12 gallons or less when the opening to be closed is not over 2.3 inches in diameter.

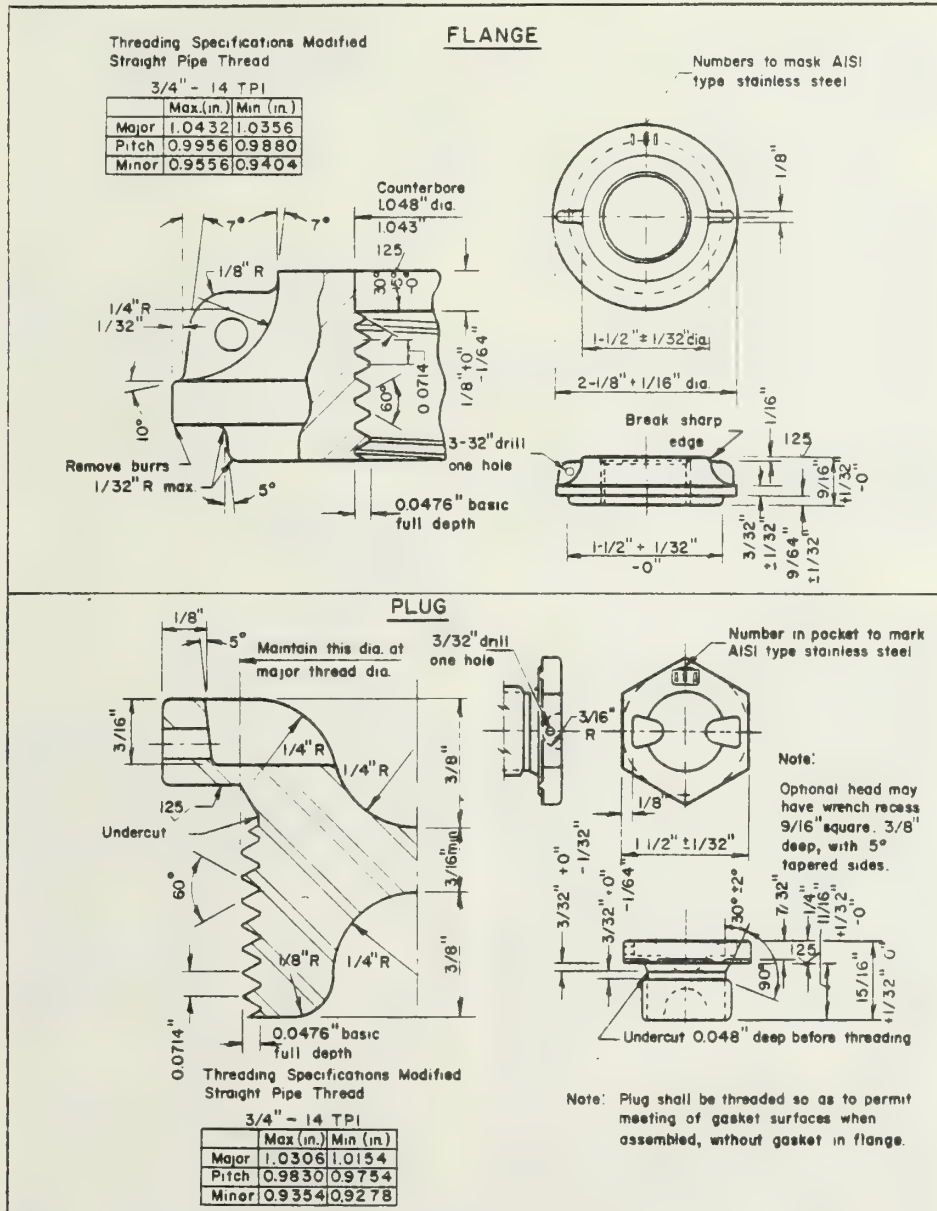
NOTE 1: This does not apply to cap seal over a closure which complies with all requirements.

(c) For closure with threaded plug or cap, the seat (flange, etc.) for plug or cap must have 5 or more complete threads; 2 drainage holes of not over $\frac{5}{16}$ -inch diameter are allowed in that section of flange which extends inside the drum. Plug or cap must have sufficient length of thread to engage 5 threads when securely tightened with gasket in place.

(d) Openings over 2.3 inches diameter are not permitted. Threads for plug or cap must be 8 or less per inch when over $\frac{3}{4}$ inch standard pipe size.

(1) Flanges with inside threads and plugs must conform with the thread diameter and thread form shown in the following drawing (other details shown on the drawing are recommended):

(1)



(e) Other threaded closures may be authorized upon demonstration of equal efficiency.

§ 178.90-9 Defective containers.

(a) Leaks and other defects to be repaired by method used in constructing container, not by soldering.

§ 178.90-10 Marking.

(a) Marking on each container by embossing on head with raised marks, or by embossing or die stamping on footing on drums equipped with footings, or on metal plates securely attached to drum by brazing or welding not less than 20 percent of the perimeter as follows:

(1) DOT-5M.

(2) Name or symbol of person making the marks specified in paragraph (a) (1) of this section. Symbol, if used, must be registered with the Bureau of Explosives.

(3) Gauge of metal in thinnest part, rated capacity in gallons, and year of manufacture (for example, 14-55-50).

§ 178.90-11 Size of markings.

(a) Size of marking (minimum): $\frac{1}{2}$ " high for 33-gallon or less, $\frac{3}{4}$ " for over 33 and not over 55 gallons.

§ 178.90-12 Type tests.

(a) Samples taken at random and closed as for use, must be capable of withstanding prescribed tests without leakage. Tests to be made of each type and size by each company starting production and to be repeated every 12 months, except as provided in subparagraph (3) of this paragraph. Samples last tested to be retained until further tests are made or for 2 years, whichever period is shorter. The type tests are as follows:

(1) Test by dropping, filled with water to 98 percent capacity, from height of 6 feet onto solid concrete so as to strike diagonally on chime, or when without chime seam, to strike on other circumferential seam; also additional drop test on any other parts which might be considered weaker than the chime. Closing devices and other parts projecting beyond chime or rolling hoops must also be capable of withstanding this test.

(2) Hydrostatic pressure test of 80 pounds per square inch sustained for 5 minutes.

(3) Periodic drop and hydrostatic tests are not required where container has

satisfactorily met prescribed tests at the original start of production. Satisfactory test results must be obtained on samples of subsequent containers that have been altered in design or construction. Samples so tested must be retained until further tests are made or for 2 years, whichever period is shorter.

§ 178.90-13 Leakage test.

(a) Each container shall be tested, with seams under water or covered with soapsuds or heavy oil, by interior air pressure of at least 15 pounds per square inch. Equally efficient means of testing are authorized upon demonstration and proof of satisfactory tests. Leakers shall be rejected or repaired and retested.

§ 178.91 Specification 5X; steel drums, aluminum lined.

Removable head containers not authorized.

§ 178.91-1 Compliance.

(a) Required in all details.

§ 178.91-2 Rated capacity.

(a) Rated capacity as marked, see § 178.91-11(a)(3). Actual capacity of straight-sided containers shall be not less than rated (marked) capacity plus 2 percent, not greater than rated capacity plus 2 percent plus 1 quart, except that for containers over 30 gallons marked capacity actual capacity shall be not less than rated capacity plus 2 percent, nor greater than rated capacity plus 2 percent plus 2 quarts; actual capacity of bilge-type containers must be not less than rated capacity, nor greater than rated capacity plus 2 percent plus 2 quarts.

§ 178.91-3 Composition.

(a) Sheets for body and heads to be low carbon, open hearth or electric steel.

§ 178.91-5 Seams.

(a) Body seams welded.

(b) Head and chime seams welded or double-seamed.

(c) Flanges for closures welded in place.

§ 178.91-6 Chime reinforcement.

(a) Containers over 25 gallons capacity, with flanged head secured to body, to have chime reinforcement adequate for its protection.

§ 178.91-7 Parts and dimensions.

(a) Parts and dimensions as follows:

Marked capacity not over (gallons)	Type of container	Minimum thickness, uncoated sheets (gauge)		Rolling hoops		
		Body sheet	Head sheet	Type ¹	Minimum	
					Size (gauge or inch)	Weight (pounds per foot)
10.....	Straight side.....	16	16	None.....		
30.....	do.....	16	16	I-bar.....	$\frac{3}{4} \times 1\frac{1}{4}$	1.25
55.....	Straight side.....	14	14	do.....	$\frac{3}{4} \times 1\frac{1}{4}$	1.60
110.....	do.....	12	12	do.....	do.....	1.60
30.....	Bulge.....	14	16	None.....		
55.....	do.....	13	14	do.....		

¹ Rolling hoops of pliable solid rubber or other suitable material are also authorized when approved as to type and construction by the Bureau of Explosives.

(b) Steel sheets of specified gauges shall comply with the following:

Gauge No.	Nominal thickness ¹ (inch)	Minimum thickness ¹ (inch)
12.....	0.1046	0.0946
13.....	.0897	.0817
14.....	.0747	.0677
16.....	.0598	.0533

¹ Thickness shall be measured at any point on the sheet not less than $\frac{3}{4}$ inch from an edge.

(c) **Lining.** Required; of aluminum 99 percent pure; thickness 0.12"; all seams welded. It shall have reasonably good fit in outside drum and be arranged so that extensive movement therein will be prevented.

§ 178.91-8 Rolling hoops.

(a) Separate hoops to have tight fit on shell and be firmly secured in place. Beading under rolling hoops or spot welding not permitted.

§ 178.91-9 Closures.

(a) Adequate to prevent leakage; shall be located between rolling hoops; aluminum plate gasket, at least 0.10 inch thick, is required. Closure must be of screw-thread type or fastened by screw-thread device. Unthreaded cap is authorized for containers of 12 gallons or less if cap is provided with outside sealing devices which cannot be removed without destroying the cap or sealing device.

(b) Closing part (plug, cap, plate, etc., see Note 1) must be of metal as thick as prescribed for head of container; this not required for containers of 12 gallons or less when the opening to be closed is not over 2.3 inches in diameter.

NOTE 1: This does not apply to cap seal over a closure which complies with all requirements.

(c) For closure with threaded plug or cap, the seat (flange, etc.) for plug, or cap must have 5 or more complete threads; two $\frac{5}{16}$ " drainage holes are allowed. Plug, or cap, must have sufficient length of thread to engage 5 threads when screwed home without gasket. Threaded cap closures, 3 full threads engaged are also authorized.

(d) Openings over 2.3" diameter not permitted. Threads for plug or cap must be 8 or less per inch when over $\frac{3}{4}$ " standard pipe size.

§ 178.91-10 Defective containers.

(a) Leaks and other defects to be repaired by method used in constructing container, not by soldering.

§ 178.91-11 Marking.

(a) Marking on each container by embossing on head with raised marks, or by embossing or die stamping on footring on drums equipped with footrings, or on metal plates securely attached to drum by brazing or welding not less than 20 percent of the perimeter as follows:

(1) DOT-5X. In addition, when the container is of stainless steel, the type of steel used in body and head sheets, as identified by American Iron and Steel

Institute type number, and also the letters HT following steel designation on containers subjected to stress relieving or heat treatment during manufacture (for example, DOT-5X-304 or DOT-5X-304 HT as applicable) shall be shown.

(2) Name or symbol of person making the marks specified in paragraph (a) (1) of this section. Symbol, if used, must be registered with the Bureau of Explosives.

(3) Gauge of metal in thinnest part, rated capacity in gallons, and year of manufacture (for example, 14-55-50). When gauge of metal in body differs from that in head, both must be indicated with slanting line between and with gauge of body indicated first (for example 14/12-55-50 for body 14 gauge and head 12 gauge).

§ 178.91-12 Size of markings.

(a) Size of marking (minimum): $\frac{1}{2}$ " high for 33-gallon or less, $\frac{3}{4}$ " for over 33 and not over 55 gallons, and 1" for over 55 gallons.

§ 178.91-13 Type tests.

(a) Samples taken at random and closed as for use, shall withstand prescribed tests without leakage. Tests to be made of each type and size by each company starting production and to be repeated every 4 months. Samples last tested to be retained until further tests are made or for 1 year, whichever period is shorter. The type tests are as follows:

(1) Test by dropping, filled with water to 98 percent capacity, from height of 6 feet onto solid concrete so as to strike diagonally on chime, or when without chime seam, to strike on other circumferential seam; also additional drop test on any other parts which might be considered weaker than the chime. Closing devices and other parts projecting beyond chime or rolling hoops must also be capable of withstanding this test.

(2) Hydrostatic pressure test of 80 pounds per square inch sustained for 5 minutes.

§ 178.91-14 Leakage test.

(a) Each container shall be tested, with seams under water or covered with soapsuds or heavy oil, by interior air pressure of at least 15 pounds per square inch. Equally efficient means of testing are authorized upon demonstration and proof of satisfactory tests. Leakers shall be rejected or repaired and retested.

§ 178.92 Specification 5P; lagged steel drums.

Removable head containers not authorized.

§ 178.92-1 Compliance.

(a) Required in all details.

§ 178.92-2 Rated capacity.

(a) Rated capacity not over 61 gallons, see § 178.92-12(a)(3). Actual capacity shall be not less than rated capacity plus two percent nor greater than rated capacity plus two percent plus one and one-half gallons.

§ 178.92-3 Composition.

(a) Sheets for body and heads of inside container to be low carbon or austenitic stainless, open hearth or electric steel. Sheets for body and heads of outside shell may be of any weldable steel suitable for the purpose.

§ 178.92-5 Construction.

(a) Container shall consist of a straight sided inside steel drum which must be lagged with a suitable fire-resistant lagging material of such insulating properties and thickness that the drum charged with the commodity to be shipped will not rupture in a fire when it is equipped with safety devices as required by § 178.92-9. The entire insulation must be covered with a metal shell so constructed that moisture cannot come in contact with lagging.

(b) Brazing is not permitted.

(c) All seams of drum and shell must be fusion welded.

(d) Flanges or bosses for closures in the inner container must be fusion welded in place to the inside drum and the metal shell.

(e) Means for testing inside drum for leaks must be provided in outside shell.

§ 178.92-6 Parts and dimensions.

(a) Parts and dimensions as follows:
 (1) Steel sheets used for body and head sheets for inside drum must have nominal thickness of at least 0.0747 inch and minimum thickness of 0.0677 inch, uncoated sheets, which shall be designated 14 gauge.

(2) Steel sheets used for body sheets for outside shell must have nominal thickness of at least 0.1046 inch and minimum thickness of 0.0946 inch, uncoated sheets, which shall be designated 12 gauge.

(3) Steel sheets used for head sheets for outside shell must have nominal thickness of at least 0.0747 inch and minimum thickness of 0.0677 inch, uncoated sheets, which shall be designated 12 gauge.

§ 178.92-7 Rolling hoops.

(a) Rolling hoops are required and these may be rolled or swedged in the outside shell or consist of separate hoops having a tight fit on shell and securely held in place.

§ 178.92-8 Closures.

(a) All closures must be of screw-thread type adequate to prevent leakage and be of a material which will not react dangerously in contact with the commodity.

(b) All openings in inside drums must be located in the top head.

(c) Openings over 2.3 inches screw thread size not permitted.

(d) Plugs, caps, or other fittings must have sufficient length of thread to engage 5 threads when screwed home with gasket in place.

(e) Gaskets which are not affected by lading are required for closures having straight threads.

§ 178.92-9 Safety devices.

(a) Each container must be provided with safety devices approved as to type and location by the Bureau of Explosives and found to prevent the bursting of the normally charged container when it is placed in a fire. See § 173.124(a)(4) of this chapter.

§ 178.92-10 Closure protection.

(a) Construction must be such as to afford adequate protection to valves and safety devices.

§ 178.92-11 Defective containers.

(a) Leaks and other defects to be repaired only by processes used in constructing container.

§ 178.92-12 Marking.

(a) Marking on each container by embossing with raised marks or by steel stamping on top head of outside shell or on a permanently attached head protective ring, as follows:

(1) DOT-5P.

(2) Name or symbol of person making the marks specified in paragraph (a)(1) of this section. Symbol, if used, must be registered with the Bureau of Explosives.

(3) Minimum gauge of metal of inner container, rated capacity in gallons and year of manufacture must be indicated in the order named (for example, 14-61-50).

(4) Size of markings (minimum): $\frac{1}{2}$ inch high for stamping, 1 inch high for embossing.

§ 178.92-13 Tests.

(a) Sample drums, taken at random and closed as for use, shall withstand prescribed tests without leakage, one test to be made of each design and size of drum by each company before starting production as follows:

(1) Test by dropping, filled with water to 98 percent capacity, from height of 4 feet on to solid concrete so as to strike diagonally on chime (foot ring), or when without chime seam, to strike on other circumferential seam; also additional drop test on any other parts which might be considered weaker.

(2) Hydrostatic pressure test of 100 pounds per square inch sustained for five minutes. This test shall be applied to the finished inner container before lagging material and outer shell are assembled.

(3) Samples last tested to be retained until further tests are made.

§ 178.92-14 Leakage test.

(a) Each container shall be subjected to a pressure test of at least 125 pounds per square inch sustained for at least 30 seconds. Test shall be applied to inner container before lagging material or

outer shell is assembled. Failures shall be rejected or repaired and retested.

NOTE 1: If air or other gas is the pressurizing medium, the test should be conducted in a pit or equivalent means of safeguarding personnel.

(b) Subsequent to the test specified in paragraph (a) of this section each container shall be tested with seams under water or covered with soapsuds or other suitable material by interior air pressure of at least 75 pounds per square inch. Leakage test shall be applied to finished inner container before lagging or outer shell is assembled. Leakers shall be rejected or repaired and retested.

§ 178.97 Specification 6A; steel barrels or drums.

Removable head containers which will pass all required tests are authorized.

§ 178.97-1 Compliance.

(a) Required in all details.

Marked capacity (gallons)	Authorized gross weight (pounds)	Type of container	Minimum thickness, uncoated sheets (gauge)		Rolling hoops		
			Body sheet	Head sheet	Type	Minimum	
						Size (gauge or inch)	Weight (pounds per foot)
5 to 10.....	160	Straight side.....	16	16	None.....		
5 to 30.....	480	do.....	14	14	I-bar.....	$\frac{1}{2} \times 1\frac{1}{4}$	1.25
5 to 33.....	480	Blige.....	13	14	None.....		
5 to 55.....	880	do.....	12	12	do.....		

(b) Steel sheets of specified gauges shall comply with the following:

Gauge No.	Nominal thickness ¹ (inch)	Minimum thickness ¹ (inch)
12.....	0.1046	0.0946
13.....	.0897	.0817
14.....	.0747	.0677
16.....	.0598	.0543

¹ Thickness shall be measured at any point on the sheet not less than $\frac{3}{8}$ inch from an edge.

§ 178.97-6 Rolling hoops.

(a) Separate hoops to have tight fit on shell and be firmly secured in place.

§ 178.97-2 Rated capacity.

(a) Rated capacity as marked, see § 178.97-9(a)(3). Actual capacity of straight-sided, containers shall be not less than rated (marked) capacity plus 2 percent, not greater than rated capacity plus 2 percent plus 1 quart, except that for containers over 30 gallons marked capacity actual capacity shall be not less than rated capacity plus 2 percent, nor greater than rated capacity plus 2 percent plus 2 quarts; actual capacity of bilge-type containers must be not less than rated capacity, nor greater than rated capacity plus 2 percent plus 2 quarts.

§ 178.97-3 Composition.

(a) Sheets for body and heads to be low carbon, open hearth or electric steel.

§ 178.97-5 Parts and dimensions.

(a) Parts and dimensions as follows:

Beading under rolling hoops or spot welding not permitted.

§ 178.97-7 Closures.

(a) Adequate to prevent leakage; gaskets required. Closures must be of screw-thread type or secured by positive fastening.

(b) Closing part (plug, cap, plate, etc., see Note 1) must be of metal as thick as prescribed for head of container; this not required for containers of 12 gallons or less when the opening to be closed is not over 2.3 inches in diameter. If unthreaded cap is used it must be provided with outside sealing devices which cannot be removed without destroying the cap or sealing device.

NOTE 1: This does not apply to cap seal over a closure which complies with all requirements.

§ 178.97-8 Defective containers.

(a) Leaks and other defects to be repaired by method used in constructing container, not by soldering.

§ 178.97-9 Marking.

(a) Marking on each container by embossing on head, except that such embossment must be on the permanent head for drums having removable heads, with raised marks, or by embossing or die stamping on footring on drums equipped with footrings, or on metal plates securely attached to drum by brazing or welding not less than 20 percent of the perimeter, as follows:

(1) DOT-6A***; stars to be replaced by the authorized gross weight (for example, DOT-6A880, etc.). In addition, when the container is of stainless steel, the type of steel used in body and head sheets, as identified by American Iron and Steel Institute type number, and also the letters HT following steel designation on containers subjected to stress relieving or heat treatment during manufacture (for example, DOT-6A880-304 or DOT-6A880-304 HT as applicable), shall be shown.

(2) Name or symbol of person making the marks specified in paragraph (a)(1) of this section. Symbol, if used, must be registered with the Bureau of Explosives.

(3) Gauge of metal in thinnest part, rated capacity in gallons, and year of manufacture (for example, 14-55-50). When gauge of metal in body differs from that in head, both must be indicated with slanting line between and with gauge of body indicated first (for example 14/12-55-50 for body 14 gauge and head 12 gauge).

§ 178.97-10 Size of markings.

(a) Size of marking (minimum): $\frac{1}{2}$ " high for 33-gallon or less, $\frac{3}{4}$ " for over 33 and not over 55 gallons.

§ 178.97-11 Type tests.

(a) Samples taken at random and closed as for use, shall withstand pre-

scribed tests without leakage. Tests to be made of each type and size by each company starting production and to be repeated every 4 months. Samples last tested to be retained until further tests are made or for 1 year, whichever period is shorter. The type tests are as follows:

(1) Test by dropping, filled with dry, finely powdered material to the authorized gross weight, from height of 4 feet onto solid concrete so as to strike diagonally on top chime, or when without chime seam, to strike on other circumferential seam; also additional drop test on any other parts which might be considered weaker than the chime. Closing devices and other parts projecting beyond chime or rolling hoops must also be capable of withstanding this test.

(2) Hydrostatic pressure test of 30 pounds per square inch sustained for 5 minutes. Leakage through closure shall not constitute failure.

§ 178.97-12 Leakage test.

(a) Each container shall be tested, with seams under water or covered with soapsuds or heavy oil, by interior air pressure of at least 15 pounds per square inch. Equally efficient means of testing are authorized upon demonstration and proof of satisfactory tests. Leakers shall be rejected or repaired and retested. Removable head containers not required to be tested with heads in place except that samples taken at random and closed as for use, of each type and size, must be tested at start of production and repeated every 4 months. Samples last tested to be retained until further tests are made or for 1 year, whichever period is shorter.

§ 178.98 Specification 6B; steel barrels or drums.

Removable head containers which will pass all required tests are authorized.

§ 178.98-1 Compliance.

(a) Required in all details.

§ 178.98-2 Rated capacity.

(a) Rated capacity as marked, see § 178.98-9(a)(3). Actual capacity of straight-sided containers shall be not less than rated (marked) capacity plus 2

percent, nor greater than rated capacity plus 2 percent, plus 1 quart, except that for containers over 30 gallons marked capacity actual capacity shall be not less than rated capacity plus 2 percent, nor greater than rated capacity plus 2 percent plus 2 quarts; actual capacity of bilge-type containers must be not less than rated capacity, nor greater than

rated capacity plus 2 percent plus 2 quarts.

§ 178.98-3 Composition.

(a) Sheets for body and heads to be low carbon, open hearth or electric steel.

§ 178.98-5 Parts and dimensions.

(a) Parts and dimensions as follows:

Marked capacity (gallons)	Authorized gross weight (pounds)	Type of Con- tainer	Minimum thickness, uncoated sheets (gauge)		Type	Rolling hoops	
			Body Sheet	Head Sheet		Minimum Size (gauge or inch)	Weight (pounds per foot)
5 to 10.....	160	Straight side.....	18	13	None.....		
5 to 30.....	480	do.....	16	16	U ¹	14	
5 to 55.....	880	do.....	14	14	U.....	12	
5 to 30.....	480	do.....	16	16	I-bar ¹	$\frac{3}{4}$ x $1\frac{1}{4}$	1.25
5 to 55.....	880	do.....	14	14	do.....	$\frac{3}{4}$ x $1\frac{1}{4}$	1.25
5 to 110.....	1,760	do.....	12	12	I-Bar.....	$\frac{3}{4}$ x $1\frac{1}{4}$	1.60
5 to 33.....	480	Bilge.....	15	16	None.....		
5 to 55.....	880	do.....	13	14	do.....		

¹ Rolled or swaged in hoops permitted.

(b) Steel sheets of specified gauges shall comply with the following:

Gauge No.	Nominal thickness ¹ (inch) *	Minimum thickness ¹ (inch)
12.....	0.1046	0.0946
13.....	.0897	.0817
14.....	.0747	.0677
15.....	.0673	.0603
16.....	.0598	.0533
18.....	.0478	.0428

¹ Thickness shall be measured at any point on the sheet less than $\frac{3}{8}$ inch from an edge.

§ 178.98-6 Rolling hoops.

(a) Separate hoops to have tight fit on shell and be firmly secured in place. Beading under rolling hoops not permitted. Attachment to drum body by spot welding, except for continuous resistance method, not permitted. Welding of I-bar type directly to body of drum in any manner not permitted.

§ 178.98-7 Closures.

(a) Adequate to prevent leakage; gas-tights required. Closures must be of screw-thread type or secured by positive fastening.

(b) Closing part (plug, cap, plate, etc., see Note 1) must be of metal as thick as prescribed for head of container; this not required for containers of 12 gallons or less when the opening to be closed is not over 2.3 inches in diameter. If unthreaded cap is used it must be provided with outside sealing devices which cannot be removed without destroying the cap or sealing device.

NOTE 1: This does not apply to cap seal over a closure which complies with all requirements.

§ 178.98-8 Defective containers.

(a) Leaks and other defects to be repaired by method used in constructing container, not by soldering.

§ 178.98-9 Marking.

(a) Marking on each container by embossing on head, except that such embossment, must be on the permanent head for drums having removable heads, with raised marks, or by embossing or die stamping on footing on drums equipped with footings, or on metal plates securely attached to drum by brazing or welding not less than 20 percent of the perimeter, as follows:

(1) DOT-6B***; stars to be replaced by the authorized gross weight (for example, DOT-6B880, etc.). In addition,

when the container is of stainless steel, the type of steel used in body and head sheets, as identified by American Iron and Steel Institute type number, and also the letters HT following steel designation on containers subjected to stress relieving or heat treatment during manufacture (for example, DOT-6B880-304 or DOT-6B880-304 HT as applicable), shall be shown.

(2) Name or symbol of person making the marks specified in paragraph (a)(1) of this section. Symbol, if used, must be registered with the Bureau of Explosives.

(3) Gauge of metal in thinnest part, rated capacity in gallons, and year of manufacture (for example, 14-55-50). When gauge of metal in body differs from that in head, both must be indicated with slanting line between and with gauge of body indicated first (for example, 14/12-55-50 for body 14 gauge and head 12 gauge).

§ 178.98-10 Size of markings.

(a) Size of markings (minimum): $\frac{1}{2}$ " high for 33-gallon or less, $\frac{3}{4}$ " for over 33 and not over 55 gallons, and 1" for over 55 gallons.

§ 178.98-11 Type tests.

(a) Samples taken at random and closed as for use, shall withstand prescribed tests without leakage. Tests to be made of each type and size by each company starting production and to be repeated every 4 months. Samples last tested to be retained until further tests are made or for 1 year, whichever period is shorter. The type tests are as follows:

(1) Test by dropping, filled with dry, finely powdered material to the authorized gross weight, from height of 4 feet onto solid concrete so as to strike diagonally on top chime, or when without chime seam, to strike on other circumferential seam; also additional drop test on any other parts which might be considered weaker than the chime. Closing devices and other parts projecting beyond chime or rolling noops, must also be capable of withstanding this test.

(2) Hydrostatic pressure test of 30 pounds per square inch sustained for 5 minutes. Leakage through closure shall not constitute failure.

§ 178.98-12 Leakage test.

(a) Each container shall be tested, with seams under water or covered with soapsuds or heavy oil, by interior air pressure of at least 15 pounds per square inch. Equally efficient means of testing are authorized upon demonstration and proof of satisfactory tests. Leakers shall be rejected or repaired and retested. Removable head containers not required to be tested with heads in place except that samples taken at random and closed as for use, of each type and size, must be tested at start of production and repeated every 4 months. Samples last tested to be retained until further tests are made or for 1 year whichever period is shorter.

§ 178.99 Specification 6C; steel barrels or drums.

Removable head containers which will pass all required tests are authorized.

§ 178.99-1 Compliance.

(a) Required in all details.

§ 178.99-2 Rated capacity.

(a) Rated capacity as marked, see § 178.99-9(a)(3). Actual capacity of straight-sided containers shall be not less than rated (marked) capacity plus 2 percent, nor greater than rated capacity plus 2 percent plus 1 quart, except that for containers over 30 gallons marked capacity actual capacity shall be not less than rated capacity plus 2 percent, nor greater than rated capacity plus 2 percent plus 2 quarts; actual capacity of bilge-type containers must be not less than rated capacity, nor greater than rated capacity plus 2 percent plus 2 quarts.

§ 178.99-3 Composition.

(a) Sheets for body and heads to be low carbon, open hearth or electric steel.

§ 178.99-5 Parts and dimensions.

(a) Parts and dimensions as follows:

Marked capacity (gallons)	Authorized gross weight (pounds)	Type of Con- tainer	Minimum thickness, uncoated sheets (gauge)		Rolling hoops		
			Body Sheet	Head Sheet	Type	Minimum	
						Size (gauge or inch)	Weight (pounds per foot)
5.....	80	Straight side.....	22	22	None.....		
5 to 10.....	160	.....do.....	20	20	.....do.....		
5 to 30.....	480	.....do.....	18	18	U.....	16	
5 to 55.....	880	.....do.....	16	16	U.....	14	
5 to 110.....	1,760	.....do.....	14	14	U.....	12	
5 to 30.....	480	.....do.....	18	18	I-bar.....	$\frac{3}{4}$ x $1\frac{1}{4}$	1.25
5 to 55.....	880	.....do.....	16	16	.....do.....	$\frac{3}{4}$ x $1\frac{1}{4}$	1.25
5 to 110.....	1,760	.....do.....	14	14	I-bar.....	$\frac{3}{4}$ x $1\frac{1}{4}$	1.60
5 to 33.....	480	Blake.....	16	18	None.....		
5 to 55.....	880	.....do.....	15	16	.....do.....		

(b) Steel sheets of specified gauges shall comply with the following:

Gauge No.	Nominal thickness ¹ (inch)	Minimum thickness ¹ (inch)
14.....	0.0747	0.0677
15.....	.0673	.0603
16.....	.0598	.0533
18.....	.0478	.0428
20.....	.0359	.0324
22.....	.0299	.0269

¹ Thickness shall be measured at any point on the sheet not less than $\frac{1}{8}$ inch from an edge.

NOTE 1: This does not apply to cap seal over a closure which complies with all requirements.

§ 178.99-8 Defective containers.

(a) Leaks and other defects to be repaired by method used in constructing container, not by soldering.

§ 178.99-9 Marking.

(a) Marking on each container by embossing on head, except that such embossment must be on the permanent head of drums having removable heads, with raised marks, or by embossing or die stamping on footring on drums equipped with footrings, or on metal plates securely attached to drum by brazing or welding not less than 20 percent of the perimeter, as follows:

(1) DOT-6C***; stars to be replaced by the authorized gross weight (for example, DOT-6C880, etc.). In addition, when the container is of stainless steel, the type of steel used in body and head sheets, as identified by American Iron and Steel Institute type number, and also the letters HT following steel designation on containers subjected to stress relieving or heat treatment during manufacture (for example, DOT-6C880-304 or DOT-6C880-304 HT as applicable) shall be shown.

(2) Name or symbol of person making the marks specified in paragraph (a)(1) of this section. Symbol, if used, must be registered with the Bureau of Explosives.

(3) Gauge of metal in thinnest part, rated capacity in gallons, and year of manufacture (for example, 14-55-50). When gauge of metal in body differs from that in head, both must be indi-

§ 178.99-6 Rolling hoops.

(a) Separate hoops to have tight fit on shell and be firmly secured in place. Beading under rolling hoops not permitted. Attachment to drum body by spot welding except for continuous resistance method, not permitted. Welding of I-bar type directly to body of drum in any manner not permitted.

§ 178.99-7 Closures.

(a) Adequate to prevent leakage; gaskets required. Closures must be of screw-thread type or secured by positive fastening.

(b) Closing part (plug, cap, plate, etc., see Note 1) must be of metal as thick as prescribed for head of container; this not required for containers of 12 gallons or less when the opening to be closed is not over 2.3 inches in diameter. If unthreaded cap is used it must be provided with outside sealing device which cannot be removed without destroying the cap or sealing device.

cated with slanting line between and with gauge of body indicated first (for example 14/12-55-50 for body 14 gauge and head 12 gauge).

§ 178.99-10 Size of markings.

(a) Size of markings (minimum): $\frac{1}{2}$ " high for 33-gallon or less, $\frac{3}{4}$ " for over 33 and not over 55 gallons, and 1" for over 55 gallons.

§ 178.99-11 Type tests.

(a) Samples taken at random and closed as for use, shall withstand prescribed tests without leakage. Tests to be made of each type and size by each company starting production and to be repeated every 4 months. Samples last tested to be retained until further tests are made or for 1 year, whichever period is shorter. The type tests are as follows:

(1) Test by dropping, filled with dry, finely powdered material to the authorized gross weight, from height of 4 feet onto solid concrete so as to strike diagonally on top chime, or when without chime seam, to strike on other circumferential seam; also additional drop test on any other parts which might be considered weaker than the chime. Closing devices and other parts projecting beyond chime or rolling hoops must also be capable of withstanding this test.

(2) Hydrostatic pressure test of 30 pounds per square inch sustained for 5 minutes. Leakage through closure shall not constitute failure.

§ 178.99-12 Leakage test.

(a) Each container shall be tested, with seams under water or covered with

soapsuds or heavy oil, by interior air pressure of at least 15 pounds per square inch. Equally efficient means of testing are authorized upon demonstration and proof of satisfactory tests. Leakers shall be rejected or repaired and retested. Removable head containers not required to be tested with head in place except that samples taken at random and closed as for use, of each type and size, must be tested at start of production and repeated every 4 months. Samples last tested to be retained until further tests are made or for 1 year, whichever period is shorter.

§ 178.100 Specification 6J; steel barrels and drums.

Removable head containers which will pass all required tests are authorized.

§ 178.100-1 Compliance.

(a) Required in all details.

§ 178.100-2 Rated capacity.

(a) Rated capacity as marked, see § 178.100-9(a)(3). Actual capacity of straight-sided containers shall be not less than rated (marked) capacity plus 2 percent, nor greater than rated capacity plus 2 percent plus 1 quart, except that for containers over 30 gallons marked capacity actual capacity shall be not less than rated capacity plus 2 percent, nor greater than rated capacity plus 2 percent plus 2 quarts; actual capacity of bilge-type containers must be not less than rated capacity, nor greater than rated capacity plus 2 percent plus 2 quarts.

§ 178.100-3 Composition.

(a) Sheets for body and heads to be low carbon, open hearth or electric steel.

§ 178.100-5 Parts and dimensions.

(a) Parts and dimensions as follows:

Marked capacity (gallons)	Authorized gross weight (pounds)	Type of Con- tainer	Minimum thickness, uncoated sheets (gauge)		Rolling hoops		
			Body Sheet	Head Sheet	Type	Minimum	
						Size (gauge or inch)	Weight (pounds per foot)
5 to 30.....	260	Straight side.....	19	19	(1).....		
5 to 55.....	480	do.....	18	18	(1).....		
5 to 55.....	880	do.....	16	16	U.....	14	
5 to 55.....	880	do.....	16	16	I-bar.....	$\frac{3}{4} \times 1\frac{1}{4}$	1.25
5 to 33.....	480	Bilge.....	16	18	None.....		
5 to 55.....	880	do.....	15	16	do.....		

¹ Rolled or swedged in hoops.

(b) Steel sheets of specified gauges shall comply with the following:

Gauge No.	Nominal thickness ¹ (inch)	Minimum thickness ¹ (inch)
15	0.0673	0.0603
16	.0598	.0533
18	.0478	.0428
19	.0418	.0378

¹ Thickness shall be measured at any point on the sheet not less than $\frac{3}{8}$ inch from an edge.

§ 178.100-6 Rolling hoops.

(a) Separate hoops to have tight fit on shell and be firmly secured in place. Beading under rolling hoops not permitted. Attachment to drum body by spot welding except for continuous resistance method, not permitted. Welding of I-bar type directly to body of drum in any manner not permitted.

§ 178.100-7 Closures.

(a) Adequate to prevent leakage; gaskets, required. Closures must be of screw-thread type or secured by positive fastening.

(b) Closing part (plug, cap, plate, etc., see Note 1) must be of metal as thick as prescribed for head of container; this not required for containers of 12 gallons or less when the opening to be closed is not over 2.3 inches in diameter. If unthreaded cap is used, it must be provided with outside sealing devices which cannot be removed without destroying the cap or sealing device.

NOTE 1: This does not apply to cap seal over a closure which complies with all requirements.

§ 178.100-8 Defective containers.

(a) Leaks and other defects to be repaired by method used in constructing container, not by soldering.

§ 178.100-9 Marking.

(a) Marking on each container by embossing on head, except that such embossment must be on the permanent head for drums having removable heads, with raised marks, or by embossing or die stamping on footing on drums equipped with footings, or on metal plates securely attached to drum by brazing or welding not less than 20 percent of the perimeter, as follows:

(1) DOT-6J***; stars to be replaced by the authorized gross weight (for ex-

ample, DOT-6J880, etc.). In addition, when the container is of stainless steel, the type of steel used in body and head sheets, as identified by American Iron and Steel Institute type number, and also the letters HT following steel designation on containers subjected to stress relieving or heat treatment during manufacture (for example, DOT-6J880-304 or DOT-6J880-304 HT as applicable), shall be shown.

(2) Name or symbol of person making the marks specified in paragraph (a)(1) of this section. Symbol, if used, must be registered with the Bureau of Explosives.

(3) Gauge of metal in thinnest part, rated capacity in gallons, and year of manufacture (for example, 14-55-50). When gauge of metal in body differs from that in head, both must be indicated with slanting line between and with gauge of body indicated first (for example 14/12-55-50 for body 14 gauge and head 12 gauge).

§ 178.100-10 Size of markings.

(a) Size of markings (minimum): $\frac{1}{2}$ " high for 33-gallon or less, $\frac{3}{4}$ " for over 33 and not over 55 gallons.

§ 178.100-11 Type tests.

(a) Samples taken at random and closed as for use, shall withstand prescribed tests without leakage. Tests to be made of each type and size by each company starting production and to be repeated every 4 months. Samples last tested to be retained until further tests are made for 1 year, whichever period is shorter. The type tests are as follows:

(1) Test by dropping, filled with dry finely powdered material to the authorized gross weight, from height of 4 feet onto solid concrete so as to strike diagonally on top chime, or when without chime seam, to strike on other circumferential seam; also additional drop test on any other parts which might be considered weaker than the chime. Closing devices and other parts projecting beyond chime or rolling hoops must also be capable of withstanding this test.

§ 178.101 Specification 6K; steel barrels or drums.

Removable head containers which will pass all required tests are authorized.

§ 178.101-1 Compliance.

(a) Required in all details.

§ 178.101-2 Rated capacity.

(a) Rated capacity as marked, see § 178.101-9(a)(3). Actual capacity of containers shall be not less than rated (marked) capacity plus 2 percent, nor

greater than rated capacity plus 2 percent plus 1 quart, except that for containers over 30 gallons marked capacity, actual capacity shall be not less than rated capacity plus 2 percent, nor greater than rated capacity plus 2 percent plus 2 quarts.

§ 178.101-3 Composition.

(a) Sheets for body and heads to be low carbon, open hearth or electric steel.

§ 178.101-5 Parts and dimensions.

(a) Parts and dimensions as follows:

Marked capacity not over (gallons)	Authorized gross weight (pounds)	Type of container	Minimum thickness, uncoated sheets (gauge)		Rolling hoops		
			Body sheet	Head sheet	Type	Minimum	
						Size (gauge or inch)	Weight (pounds per foot)
55	480	Straight side.....	18	18	I-bar ¹	$\frac{3}{4} \times 1\frac{1}{4}$	1.25

¹ Rolled or swaged-in hoops permitted.

(b) Steel sheets of specified gauges shall comply with the following:

Gauge No.	Nominal thickness ¹ (inch)	Minimum thickness ¹ (inch)
18.....	0.0478	0.0428

¹ Thickness shall be measured at any point on the sheet not less than $\frac{3}{8}$ inch from an edge.

§ 178.101-6 Rolling hoops.

(a) Separate hoops to have tight fit on shell and be firmly secured in place. Beading under rolling hoops or spot welding not permitted.

§ 178.101-7 Closures.

(a) Adequate to prevent leakage; gaskets required. Closures must be of screw-thread type or secured by positive fastening

(b) Closing part (plug, cap, plate, etc., see Note 1) must be of metal as thick as prescribed for head of container; this not required for containers of 12 gallons or less when the opening to be closed is not over 2.3 inches in diameter. If unthreaded cap is used it must be provided

with outside sealing devices which cannot be removed without destroying the cap or sealing device.

NOTE 1: This does not apply to cap seal over a closure which complies with all requirements.

§ 178.101-8 Defective containers.

(a) Leaks and other defects to be repaired by method used in constructing container, not by soldering.

§ 178.101-9 Marking.

(a) Marking on each container by embossing on head, except that such embossment must be on the permanent head for drums having removable heads, with raised marks, or by embossing or die stamping on footring on drums equipped with footrings, or on metal plates securely attached to drum by brazing or welding not less than 20 percent of the perimeter, as follows:

(1) DOT-6K480. In addition, when the container is of stainless steel, the type of steel used in body and head sheets, as identified by American Iron and Steel Institute type number, and also the letters HT following steel designation on

containers subjected to stress relieving or heat treatment during manufacture (for example, DOT-6K480-304 or DOT-6K480-304 HT as applicable), shall be shown.

(2) Name or symbol of person making the marks specified in paragraph (a) (1) of this section. Symbol, if used, must be registered with the Bureau of Explosives.

(3) Gauge of metal in thinnest part, rated capacity in gallons, and years of manufacture (for example, 18-55-50).

§ 178.101-10 Size of markings.

(a) Size of markings (minimum): $\frac{1}{2}$ " high for 33-gallon or less, $\frac{3}{4}$ " for over 33 and not over 55 gallons.

§ 178.101-11 Type tests.

(a) Samples taken at random and closed as for use, shall withstand prescribed tests without leakage. Tests to be made of each type and size by each company starting production and to be repeated every 4 months. Samples last tested to be retained until further tests are made or for 1 year, whichever period is shorter. The type tests are as follows:

(1) Test by dropping, filled with dry, finely powdered material to the authorized gross weight, from height of 4 feet onto solid concrete so as to strike diagonally on top chime, or when without chime seam, to strike on other circumferential seam; also additional drop test on any other parts which might be considered weaker than the chime. Closing

devices and other parts projecting beyond chime or rolling hoops must also be capable of withstanding this test.

(2) Hydrostatic pressure test of 15 pounds per square inch sustained for 5 minutes. Leakage through closure shall not constitute failure.

§ 178.101-12 Leakage test.

(a) Each container shall be tested, with seams under water or covered with soapsuds or heavy oil, by interior air pressure of at least 7 pounds per square inch. Equally efficient means of testing are authorized upon demonstration and proof of satisfactory tests. Leakers shall be rejected or repaired and retested. Removable head containers not required to be tested with heads in place except that samples taken at random and closed as for use, of each type and size, must be tested at start of production and repeated every 4 months. Samples last tested to be retained until further tests are made or for 1 year, whichever period is shorter.

§ 178.102 Specification 6D; cylindrical steel overpack, straight sided, for inside plastic container.

§ 178.102-1 Material requirements.

(a) Sheets for body and heads to be low carbon, open hearth or electric steel.

§ 178.102-2 Construction requirements.

(a) Construction requirements are as follows:

Rated capacity of inside plastic container not over (gallons)	Minimum thickness, uncoated sheets (gauge)		Body seams	Rolling hoops	Top or bottom head	Closures, when full removable head is used (gaskets not required)
	Body sheet	Head sheet				
5.....	24	24	Welded.....	None required....	Double seamed or welded.	Lug or plain ring seal.
15.....	20	20	do.....	Rolled or swedged.	do.....	Do.
30.....	19	19	do.....	do.....	do.....	Bolted type ring closure, 18 gauge.
55.....	18	18	do.....	Rolled or swedged, or 1-Bars, $\frac{3}{4}$ " x $1\frac{1}{4}$ ".	do.....	Bolted type ring closure, 16 gauge.

(b) Steel sheets or parts of specified gauges shall comply with the following:

Gauge No.	Nominal thickness (inch) ¹	Minimum thickness (inch) ¹
16.....	0.0598	0.0533
18.....	.0478	.0428
19.....	.0418	.0378
20.....	.0359	.0324
24.....	.0239	.0209

¹ Thickness shall be measured at any point on the sheet not less than $\frac{3}{16}$ inch from an edge.

(c) Two holes not exceeding $\frac{1}{4}$ inch each are permitted diametrically opposite each other in the overpack body immediately above the double seam of the bottom chime or three holes not exceeding $\frac{3}{16}$ inch in diameter on centers 120 degrees apart in the bottom head.

(1) Overpack interior shall be free of projections, burrs, or any edges that might cause damage to inside plastic container and shall be free of lubricants, oils, or any foreign matter.

(2) Top head may have not more than two holes of suitable size to provide for protruding closures.

(3) Overpack shall be constructed to provide a snug fit for inside plastic container.

§ 178.102-3 Tests.

(a) Steel overpack when assembled as for use, shall withstand the tests prescribed in specifications for inside plastic containers as detailed in Part 178 when authorized as combination packages in Part 173 of this chapter. The completed package must withstand these tests without producing a condition of the overpack that could result in potential damage to the inside container.

§ 178.102-4 Markings.

(a) Marking on each container by embossing on bottom head with raised marks with letters and figures not less than $\frac{1}{2}$ inch high as follows:

(1) DOT-6D.

(2) Name or symbol of person making the marks specified in paragraph (a) (1) of this section. Symbol, if used, must be registered with the Bureau of Explosives.

(3) Gauge of metal in thinnest part, rated capacity of inside container in gallons, and year of manufacture (for example, 18-55-62). When gauge of

metal in body differs from that in either head, both must be indicated with slanting line between and with gauge of body indicated first (for example, 18/16-55-62 for body 18 gauge and head 16 gauge).

§ 178.103 Specification 6L; metal packaging.

§ 178.103-1 General requirements.

Each packaging must meet the applicable requirements of § 173.24 of this subchapter.

[Amdt. 178-35, 39 FR 45246, Dec. 31, 1974]

§ 178.103-2 Rated capacity.

(a) Rated capacity as marked (see § 178.103-6). Not less than 55 gallons nor more than 110 gallons for the outer steel drum. Not more than 17.74 liters for the inner vessel.

(b) The authorized maximum gross weight of the package is 160 kilograms (350 pounds) for sizes not over 210L (55 gallons) or 220 kilograms (480 pounds) for sizes over 210L (55 gallons) but not over 420L (110 gallons).

§ 178.103-3 General construction requirements.

(a) The outer shell must be of straight sided steel, with welded body seams and at least 18-gauge body and bottom head sheets, and 14-gauge removable head sheets (unless there are one or more corrugations in the cover near the periphery, in which case 16-gauge is authorized). The shell may be either a single sheet of steel or may be fabricated by welding together two appropriate lengths of 210L (55-gallon) drums, such as a DOT Specification 6J or 17H, with rolled or swaged in hoops as prescribed for either of those specifications. The head must be convex (crowned), not extending beyond the level of the chime, with a minimum convexity of 1 centimeter ($\frac{3}{8}$ -inch). The inside diameter of the shell must be at least 57 centimeters (22.5 inches).

(b) Inner containment vessel must conform to specification 2R (except that

cast iron is not authorized), with a maximum usable inside dimension of 13.3 centimeters (5.25 inches) maximum height of 127 centimeters (50 inches) (with caps in place) and minimum wall thickness of 6 millimeters (0.25 inch).

(c) Inner containment vessel must be fixed within the outer shell by one of the following types of centering devices:

(1) At least 8 steel rod spacers, of at least 6 millimeters (0.25-inch) diameter (for packages of 210 liters (55-gallon) capacity) or 1 centimeter of (0.375-inch) diameter (for packages with greater than 210 liters (55-gallon) capacity) cold rolled steel, welded to the vessel at each end by minimum 5 centimeter (2-inch) continuous weld. Each rod must be welded to the vessel at radial positions not exceeding 45 degrees as not to interfere with closure of the inner vessel. Each spacer rod must extend at least 5.6 centimeters (2.25 inches) beyond the inner vessel at each end, then radially to the wall of the outer drum (to provide a springlike snug fit) and along the entire length of the wall of the outer drum. For a packaging of more than 210 liters (55-gallon) capacity, each spacer rod must be braced by welding a 6 millimeter (0.25-inch) by 5 centimeter (2-inch) steel plate to the spacer rod and the pipe with a continuous weld at each joint, the joints being located approximately half way along the length of the drum. For containers manufactured prior to March 31, 1975, this requirement is effective December 31, 1975.

(2) At least three steel "spiders," not more than 24 inches apart, with each spider having at least four legs. Each leg must be constructed of materials having dimensions not less than those listed in this subparagraph, welded by continuous weld at each joint to inner and outer steel bands of at least $\frac{1}{4}$ -inch by 1-inch steel. The inner steel band must be welded to the inner vessel by at least six 2-inch welds on both edges of the band. The outer steel band must be welded to the outer drum by at least six 2-inch welds on both edges of the top outer band, such that the inner vessel is at least $2\frac{1}{4}$ inches from the top and bottom of the drum. Authorized construction materials are:

(i) 2.5 centimeters (1 inch) by 2.5 centimeters (1 inch) by 6 millimeters ($\frac{1}{4}$ -inch) steel angle iron.

(ii) 3 centimeters ($1\frac{1}{4}$ inches) by 3 centimeters ($1\frac{1}{4}$ inches) by 5 millimeters ($\frac{3}{16}$ -inch) steel angle iron.

(iii) 2.5 centimeters (1 inch) schedule 40 steel pipe.

(iv) $1\frac{1}{2}$ -inch diameter solid steel rods, with only two such spiders required instead of three.

(3) There must not be less than 2 spacer mechanisms for a packaging of 210 liters (55-gallon) capacity nor less than 3 spacer mechanisms for a packaging greater than 210 liters (55-gallon) capacity. Each spacer mechanism must consist of not less than 6 steel angles, pipe, or rod radial supports of at least 2.7 square centimeters (0.42 square inch) cross-section. Each radial support must be welded at one end to the containment vessel by a continuous weld or to an inner steel band of at least 6 millimeters ($\frac{1}{4}$ -inch) by 2.5 centimeters (1 inch) by a continuous weld at radial positions not exceeding 60 degrees from the center of the package. The inner band, when used, must be welded to the inner containment vessel by at least 6 equally spaced 5 centimeter (2-inch) welds on each edge of the band. The opposite end of the radial support must be welded by a continuous weld to an outer steel band of at least 6 millimeters ($\frac{1}{4}$ -inch) by 2.5 centimeters (1 inch). The outer steel band must be welded to the outer shell by at least 6 equally spaced welds on each edge of the top band, such that the inner vessel is fixed at least 5.7 centimeters (2.25 inches) from the top and bottom of the drum. The spacer mechanism must be welded as specified near each end of the containment vessel so as not to interfere with the vessel closure. For a packaging greater than 210L (55-gallon) capacity, the additional spacer mechanism must be located at approximately midpoint along the length of the inner vessel.

(d) The void between the inner containment vessel and the outer shell must be completely filled with bagged or tamped vermiculite (expanded mica), with a density of at least 0.072 g/cc (4.5 pounds per cubic foot). Loose, untamped vermiculite is not authorized.

§ 178.103-4 Welding.

Welding must be of material having a melting point in excess of 800° C (1475° F) (except that for packages constructed prior to March 31, 1975, this temperature may be 540° C (1000° F)), with a joint efficiency of at least 0.85. This requirement applies to welding used in adding spacer rods to comply with 178.103(3)(c)(1).

§ 178.103-5 Closure.

(a) The outer drum closure must be at least a 12-gauge bolted ring with drop forged lugs, one of which is threaded, and having at least a 1.6 centimeter ($\frac{5}{8}$ -inch) diameter steel bolt and a lock nut, or equivalent device.

(b) The closure device must have a means for the attachment of a tamper-proof lock wire and seal, or equivalent.

§ 178.103-6 Markings.

(a) Markings on each container, by die stamping on a metal plate attached to the outside of the outer container by spot welding, or other equally efficient method, in letters and figures of at least one-fourth inch in height, as follows:

(1) "DOT-6L".

(2) "FISSILE RADIOACTIVE MATERIAL."

(3) Name or symbol of person making the marks specified in paragraph (a)

(1) of this section. Symbol, if used, must be registered with the Bureau of Explosives.

(4) Gauge of metal of the outer steel drum in the thinnest part, rated capacity of the outer steel drum in gallons, and the year of manufacture of the assembled package (e.g., 18-110-68). When the gauge of the metal in the drum wall differs from that in the head, both must be indicated with a slanting line between, and with the gauge of the body indicated

first (e.g., 18/16-110-68 for 18-gauge body and 16-gauge head).

§ 178.104 Specification 6M; metal packaging.

§ 178.104-1 General requirements.

(a) Each package must meet the applicable requirements of § 173.24 of this chapter.

§ 178.104-2 Rated capacity.

(a) Rated capacity as marked (see § 178.104-5). Not less than 10 gallons nor more than 110 gallons for the outer steel drum. Not less than 1.24 liters for the inner containment vessel.

§ 178.104-3 General construction requirements.

(a) The outer shell must be of straight-sided steel, with welded body seams, and may be either a single sheet of steel, or may be fabricated by welding together two appropriate lengths of drums, such as a DOT Specification 6C or 17C, with each length to contain 3 swedged or rolled rolling hoops as prescribed for either of these specifications. A removable head for a packaging of 210 liters (55 gallons) or larger volume must have one or more corrugations in the cover near the periphery. For a packaging exceeding 57 liters (15 gallons) volume, the head must be crowned (convexed), not extending beyond the level of the chime, with a minimum convexity of 1 centimeter ($\frac{3}{8}$ -inch).

(1) The maximum authorized gross weight, metal thickness, and minimum end insulation thickness for the marked volume is as follows:

Marked capacity		Maximum authorized gross weight		Minimum thickness of uncoated sheets and heads (gage)	Minimum thickness of end insulation	
Gallons not over	Liters	Pounds	Kilograms		Inches	Centimeters
15	57	160	73	20	1.88	4.7
30	114	490	219	18	3.75	9.5
55	210	640	292	16	3.75	9.5
110	420	640	292	16	3.75	9.5

(2) Each drum must have at least four 1.2 centimeter (0.5-inch) diameter vents near the top, each covered with a weatherproof tape or fusible plug; or equivalent device. A layer of porous refractory fiber may be placed behind the pressure-relief vent holes.

(b) Inner containment vessel must conform to specification 2R or equivalent (cast iron or brass are prohibited), with maximum usable inside diameter of 13.3 centimeters (5.25 inches), minimum usable inside diameter of 10 centimeters (4 inches), and minimum height of 15 centimeters (6 inches).

(c) Inner containment vessel must be fixed within the outer shell by one of the following types of solid centering media, with the sides of the inner vessel protected by at least 9.5 centimeters (3.75 inches) of insulation media, and the ends with at least the thickness as prescribed in § 178.104-3(a)(1).

(1) Machined discs and rings made of solid industrial cane fiberboard having a density of at least 0.24 g/cc (15 pounds per cubic foot) fitted such that the radial clearances between the fiberboard, inner vessel, and shell do not exceed 6 millimeters ($\frac{1}{4}$ -inch); or

(2) Hardwood or plywood at least 1.2 centimeter ($\frac{1}{2}$ -inch) thick, having a density of at least 0.45 g/cc (28 pounds per cubic foot). There must be no gap or direct heat path from the shell to the inner vessel.

(d) Any radiation shielding material used must be placed within the inner containment vessel or must be protected in all directions by at least the thickness of the thermal insulating material prescribed in paragraph (a) of this section.

(e) For a packaging having an authorized gross weight in excess of 219 kg (480 pounds), a steel bearing plate, at least 6 millimeters (0.25-inch) thick or a plywood disc, at least 2.5 centimeters (1 inch) thick, and at least 25 centimeters (10 inches) in diameter must be provided at both ends and adjacent to the specification 2R inner containment vessel, to provide additional load-bearing surface against the insulation-centering medium.

§ 178.104-4 Closure.

(a) The outer drum closure must be at least 16-gauge bolt-type locking ring

having at least a $\frac{5}{16}$ -inch steel bolt for drum sizes not over 15 gallons, or a 12-gauge bolted ring with drop-forged lugs, one of which is threaded, and a $\frac{5}{8}$ -inch steel bolt for drum sizes over 15 gallons. Each bolt must be provided with a lock nut or equivalent device.

(b) The closure device must have means for the attachment of a temper-proof lock wire and seal, or equivalent.

§ 178.104-5 Markings.

(a) Marking must be as prescribed in § 173.24 of this chapter.

(b) Marking on the outside of each package must be as follows: "DOT-6M Type B, "Radioactive Materials," or "Fissile Radioactive Materials," as appropriate; and the gauge of metal of the outer drum in the thinnest part, rated capacity of the outer drum in gallons, and year of manufacture (for example, 18-30-69). When the gauge of the metal in the drum wall differs from that in the head, both must be indicated with a slanting line between, and with the gauge of the body indicated first (e.g., 18/16-55-69 for 18-gauge body and 16-gauge head).

§ 178.107 Specification 42B; aluminum drums.

§ 178.107-1 Compliance.

(a) Required in all details.

§ 178.107-2 Rated capacity.

(a) Rated capacity as marked, see § 178.107-9(a)(3). Not less than 5 gallons; actual capacity shall be rated capacity plus at least 2 percent.

§ 178.107-3 Composition.

(a) Body and heads of aluminum at least 99 percent pure, or an aluminum base alloy of equivalent corrosion resistance and physical properties.

§ 178.107-4 Outage.

(a) Two percent of rated capacity, plus a maximum tolerance of 1 quart.

§ 178.107-5 Seams.

(a) Welded, including attachment of flanges for closures and other devices.

Circumferential seams at least 3" from top of chime; chime seams not permitted.

§ 178.107-6 Parts and dimensions.

(a) Parts and dimensions as follows:

Marked capacity not over (gallons)	Minimum thickness of material (inch)	Rolling hoops required, type authorized, and minimum dimensions	
		I-bar, size (inch)	U-type, aluminum, thickness (inch)
10	0.110	$\frac{3}{4} \times 1\frac{1}{4}$	0.129
30	154	$\frac{3}{4} \times 1\frac{1}{4}$	.192
55	187	$\frac{3}{4} \times 1\frac{1}{4}$	.234
110	230	$\frac{3}{4} \times 1\frac{1}{4}$	-----

(b) Rolling hoops must be firmly secured in place and not over 19 inches apart; beading under hoops not permitted. If welding is employed, the

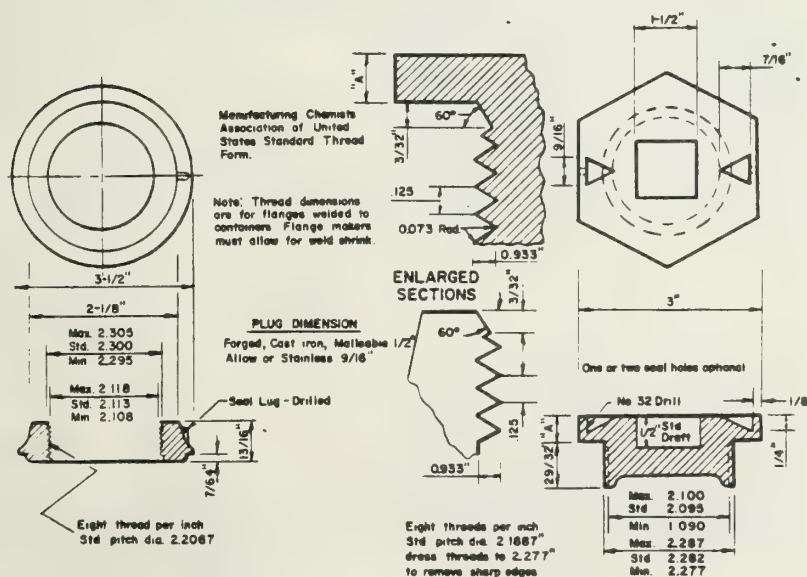
welding must be continuous on each edge of hoop.

§ 178.107-7 Closures.

(a) Of screw-thread type or secured by screw-thread device; openings over 2.3" not authorized; suitable gaskets required.

(b) Threaded plugs, or caps, and flanges must be close fitting with gasket surfaces which bear squarely on each other when without gasket; they must have not over 8 threads per inch, with 5 complete threads engaged when gasket is in place, or not over 4 threads per inch, with 2 complete threads similarly engaged; two $\frac{3}{16}$ inch drainage holes are authorized in flange. Thread form must conform to that shown by drawing below or be of a form that shall provide an equally efficient closure.

FLANGE and PLUG



§ 178.107-8 Projections.

(a) Closing devices and other parts must not project beyond chime or rolling hoops.

§ 178.107-9 Marking.

(a) Marking on each container on top head by stamping with pressure dies, by

embossing with raised marks, or plate attached by welding, as follows:

(1) DOT-42B.

(2) Name or symbol of person making the mark specified in paragraph (a) (1) of this section and located just above, below, or following that mark.

Symbol, if used, must be registered with the Bureau of Explosives.

(3) Gauge of metal, Brown and Sharpe or equivalent decimal thickness in inches, at start of fabrication; rated capacity in gallons; year of manufacture (for example, 7-30-50 or 0.1442-30-50).

§ 178.107-10 Size of marking.

(a) Size of marking (minimum): $\frac{1}{2}$ " high for 30-gallon and smaller containers, $\frac{3}{4}$ " for over 30 and not over 55 gallons, and 1" for over 55 gallons.

§ 178.107-11 Type tests.

(a) Samples taken at random and closed as for use, shall withstand prescribed tests without leakage. Tests to be made of each type and size by each company starting production and to be repeated every 4 months. Samples last tested to be retained until further tests are made or for 1 year, whichever period is shorter. The type tests are as follows:

(1) Test by dropping, filled with water to 98 percent capacity, from height of 6 feet onto solid concrete so as to strike diagonally on chime, or when without chime seam, to strike on other circumferential seam; also additional test on any other parts which might be considered weaker than the chime.

(2) Hydrostatic pressure test of 60 pounds per square inch sustained for 5 minutes.

§ 178.107-12 Leakage test.

(a) Each container shall be tested, with seams under water or covered with soapsuds or heavy oil, by interior air pressure of at least 15 pounds per square inch. Equally efficient means of testing are authorized upon demonstration and proof of satisfactory tests. Leakers shall be rejected or repaired and retested.

§ 178.107-13 Defective containers.

(a) Leaks and other defects shall be repaired by welding, using welding material of the same composition as originally used by the manufacturer of the drum or other approved aluminum base alloy of equal corrosion and strength qualities.

§ 178.108 Specification 42C; aluminum barrels or drums.

§ 178.108-1 Compliance.

(a) Required in all details.

§ 178.108-2 Rated capacity.

(a) Rated capacity as marked, see § 178.108-9(a)(3). Not less than 5 gallons; actual capacity shall be rated capacity plus at least 2 percent.

§ 178.108-3 Composition.

(a) Body and heads of aluminum at least 99 percent pure, or an aluminum base alloy of equivalent corrosion resistance and physical properties.

§ 178.108-4 Outage.

(a) Two percent of rated capacity, plus a maximum tolerance of 1 quart.

§ 178.108-5 Seams.

(a) Welded, including attachment of flanges for closures and other devices. Circumferential seams at least 3" from top of chime; chime seams not permitted.

§ 178.108-6 Parts and dimensions.

(a) Parts and dimensions as follows:

Marked capacity not over (gallons)	Type of container	Minimum thickness of material (inch)	Rolling hoops required, type authorized, and minimum dimensions	
			I-bar, size (inches)	U-type, aluminum, thickness (inch)
10.....	Straight side.	0.093	$\frac{3}{4} \times 1\frac{1}{4}$	0.116
30.....	do.....	.129	$\frac{3}{4} \times 1\frac{1}{4}$	.161
55.....	do.....	.155	$\frac{1}{2} \times 1\frac{1}{4}$	.194
110.....	Straight side.	.192	$\frac{3}{4} \times 1\frac{1}{2}$	
15.....	Bilge.....	110	Expanded from shell. ¹	
30.....	do.....	150	Do.	
55.....	do.....	180	Do.	

¹ Only required when side openings are used.

(b) Rolling hoops must be firmly secured in place and not over 19 inches apart; beading under hoops not permitted. If welding is employed, the welding must be continuous on each edge of hoop.

§ 178.108-7 Closures.

(a) Of screw-thread type or secured by screw-thread device; openings over 2.3" not authorized; suitable gaskets required.

(b) Threaded plugs, or caps, and flanges must be close fitting with gasket surfaces which bear squarely on each other when without gasket; they must have not over 8 threads per inch, with 5 complete threads engaged when gasket is in place, or not over 4 threads per inch, with 2 complete threads similarly engaged; two $\frac{3}{16}$ inch drainage holes are authorized in flange. Thread form must conform to that shown by drawing in paragraph (b) of § 178.107-7 or be of a form that shall provide an equally efficient closure.

§ 178.108-8 Projections.

(a) Closing devices and other parts must not project beyond chime or rolling hoops.

§ 178.108-9 Marking.

(a) Marking on each container on top head, by stamping with pressure dies, by embossing with raised marks, or plate attached by welding, as follows:

(1) DOT-42C.

(2) Name or symbol of person making the mark specified in paragraph (a)(1) of this section and located just above, below, or following that mark. Symbol, if used, must be registered with the Bureau of Explosives.

(3) Gauge of metal, Brown and Sharpe or equivalent decimal thickness in inches, at start of fabrication; rated capacity in gallons; year of manufacture (for example, 7-30-50 or 0.1442-30-50).

§ 178.108-10 Size of marking.

(a) Size of marking (minimum): $\frac{1}{2}$ " high for 30-gallon and smaller containers, $\frac{3}{4}$ " for over 30 and not over 55 gallons, and 1" for over 55 gallons.

§ 178.108-11 Type tests.

(a) Samples taken at random and closed as for use, shall withstand prescribed tests without leakage. Tests to be made of each type and size by each company starting production and to be repeated every 4 months. Samples last tested to be retained until further tests

are made or for 1 year, whichever period is shorter. The type tests are as follows:

(1) Test by dropping, filled with water to 98 percent capacity, from height of 6 feet onto solid concrete so as to strike diagonally on chime, or when without chime seam, to strike on other circumferential seam; also additional test on any other parts which might be considered weaker than the chime.

(2) Hydrostatic pressure test of 60 pounds per square inch sustained for 5 minutes.

§ 178.108-12 Leakage test.

(a) Each container shall be tested, with seams under water covered with soapsuds or heavy oil, by interior air pressure of at least 15 pounds per square inch. Equally efficient means of testing are authorized upon demonstration and proof of satisfactory tests. Leakers shall be rejected or repaired and retested.

§ 178.108-13 Defective containers.

(a) Leaks and other defects shall be repaired by welding, using welding material of the same composition as originally used by the manufacturer of the drum or other approved aluminum base alloy of equal corrosion and strength qualities.

§ 178.109 Specification 42D; aluminum drums.

§ 178.109-1 Compliance.

(a) Required in all details.

§ 178.109-2 Rated capacity.

(a) Rated capacity as marked, see § 178.109-9(a)(3). Not less than 5 gallons; actual capacity shall be rated capacity plus at least 2 percent.

§ 178.109-3 Composition.

(a) Body and heads of aluminum at least 99 percent pure, or an aluminum base alloy of equivalent corrosion resistance and physical properties.

§ 178.109-4 Outage.

(a) Two percent of rated capacity, plus a maximum tolerance of 1 quart.

§ 178.109-5 Seams.

(a) Welded, including attachment of flanges for closures and other devices. Circumferential seams at least 3" from top of chime; chime seams not permitted.

§ 178.109-6 Parts and dimensions.

(a) Parts and dimensions as follows:

Marked capacity not over (gallons)	Minimum thickness of material (inch)	Rolling hoops required, type authorized, and minimum dimensions	
		I-bar, size (inch)	U-type, aluminum, thickness (inch)
10	0.093	$\frac{3}{4} \times 1\frac{1}{4}$	0.092
30	.102	$\frac{3}{4} \times 1\frac{1}{4}$	.128
55	.123	$\frac{3}{4} \times 1\frac{1}{4}$	.154
110	.154	$\frac{3}{4} \times 1\frac{1}{4}$	

(b) Rolling hoops must be firmly secured in place and not over 19 inches apart; beading under hoops not permitted. If welding is employed, the welding must be continuous on each edge of hoop.

§ 178.109-7 Closures.

(a) Of screw-thread type or secured by screw-thread device; openings over 2.3" not authorized; suitable gaskets required. Vented closing devices of type approved by the Bureau of Explosives are authorized when specified by the purchaser.

(b) Threaded plugs, or caps, and flanges must be close fitting with gasket surfaces which bear squarely on each other when without gasket; they must have not over 8 threads per inch, with 5 complete threads engaged when gasket is in place, or not over 4 threads per inch, with 2 complete threads similarly engaged; two $\frac{3}{16}$ inch drainage holes are authorized in flange. Thread form must conform to that shown by drawing in paragraph (b) of § 178.107-7 or be of a form that shall provide an equally efficient closure.

§ 178.109-8 Projections.

(a) Closing devices and other parts must not project beyond chime or rolling hoops.

§ 178.109-9 Marking.

(a) Marking on each container on top head, by stamping with pressure dies, by embossing with raised marks, or plate attached by welding, as follows:

(1) DOT-42D.

(2) Name or symbol of person making the mark specified in paragraph

(a)(1) of this section and located just above, below, or following that mark. Symbol, if used, must be registered with the Bureau of Explosives.

(3) Gauge of metal, Brown and Sharpe or equivalent decimal thickness in inches, at start of fabrication; rated capacity in gallons; year of manufacture (for example, 7-30-50 or 0.1442-30-50).

§ 178.109-10 Size of marking.

(a) Size of marking (minimum): $\frac{1}{2}$ " high for 30-gallon and smaller containers, $\frac{3}{4}$ " for over 30 and not over 55 gallons, and 1" for over 55 gallons.

§ 178.109-11 Type tests.

(a) Samples taken at random and closed as for use, shall withstand prescribed tests without leakage. Tests to be made of each type and size by each company starting production and to be repeated every 4 months. Samples last tested to be retained until further tests are made or for 1 year, whichever period is shorter. The type tests are as follows:

(1) Test by dropping, filled with water to 98 percent capacity, from height of 4 feet onto solid concrete so as to strike diagonally on chime, or when without chime seam, to strike on other circumferential seam; also additional test on any other parts which might be considered weaker than the chime.

(2) Hydrostatic pressure test of 40 pounds per square inch sustained for 5 minutes.

§ 178.109-12 Leakage test.

(a) Each container shall be tested, with seams under water or covered with soapsuds or heavy oil, by interior air pressure of at least 10 pounds per square inch. Equally efficient means of testing are authorized upon demonstration and proof of satisfactory tests. Leakers shall be rejected or repaired and retested.

§ 178.109-13 Defective containers.

(a) Leaks and other defects shall be repaired by welding, using welding material of the same composition as originally used by the manufacturer of the drum or other approved aluminum base

alloy of equal corrosion and strength qualities.

§ 178.110 Specification 42F; aluminum barrels or drums.

Removable heads.

§ 178.110-1 Compliance.

(a) Required in all details.

§ 178.110-2 Rated capacity.

(a) Rated capacity as marked, see § 178.110-8(a)(3). Actual capacity shall be not less than rated capacity, nor

greater than rated capacity plus 2 percent plus 1 gallon.

§ 178.110-3 Composition.

(a) Body and heads of aluminum alloy 6061 or an aluminum base alloy of equivalent corrosion resistance and physical properties.

§ 178.110-4 Seams.

(a) None. Body shall be seamless.

§ 178.110-5 Parts and dimensions.

(a) Parts and dimensions as follows:

Marked capacity not over (gallons)	Authorized gross weight not over (pounds)	Type of con- tainer	Minimum thickness of material (inch)		Rolling hoops
			Body	Head	
50	450	Bilge	0.091	0.102	None

§ 178.110-6 Closures.

(a) Adequate to prevent leakage; gaskets required.

(b) Closures must be of bolted ring type made of not less than 10 gauge carbon steel with drop forged threaded lugs and $\frac{5}{8}$ " minimum diameter cap screw.

§ 178.110-7 Defective containers.

(a) Leaks and other defects shall be repaired by welding, using welding material of same composition as parts being repaired.

§ 178.110-8 Marking.

(a) Marking on each container by embossing on head, except that such embossment must be on the permanent head for drums having removable heads, with raised marks, or by embossing or die stamping on footring on drums equipped with footrings, or on metal plates securely attached to drum by brazing or welding not less than 20 percent of the perimeter, as follows:

(1) DOT-42F * * * ; stars to be replaced by the authorized gross weight (for example, DOT-42F450, etc.).

(2) Name or symbol of person making the marks specified in paragraph (a)(1) of this section. Symbol, if used, must be registered with the Bureau of Explosives.

(3) Gauge of metal, Brown and Sharpe or equivalent decimal thickness in inches in thinnest part; rated capacity in gallons; and year of manufac-

ture (for example, 11-50-52 or 0.0907-50-52). When gauge of metal in body differs from that in head, both must be indicated with slanting line between and with gauge of body indicated first (for example, 11/10-50-52 or 0.0907/0.1018 50-52 for body 11-gauge and head 10-gauge).

§ 178.110-9 Size of markings.

(a) Size of markings (minimum): $\frac{1}{2}$ " high for 33 gallons or less, $\frac{3}{4}$ " for over 33 gallons.

§ 178.110-10 Type tests.

(a) Samples taken at random and closed as for use, shall withstand prescribed tests without leakage. Tests to be made of each type and size by each company starting production and to be repeated every 4 months. Samples last tested to be retained until further tests are made or for 1 year, whichever period is shorter. The type tests are as follows:

(1) Test by dropping, filled with dry, finely powdered material to the authorized gross weight, from height of 4 feet onto solid concrete so as to strike diagonally on top chime, or when without chime seam to strike on other circumferential seam; also an additional drop test on any other parts which might be considered weaker than the chime. Closing devices and other parts projecting beyond chime must also be capable of withstanding this test.

(2) Hydrostatic pressure test of 30 pounds per square inch sustained for 5 minutes. Leakage through closure shall not constitute failure.

§ 178.110-11 Leakage test.

(a) Each container shall be tested under water or covered with soapsuds or heavy oil, by interior air pressure of at least 15 pounds per square inch. Equally efficient means of testing are authorized upon demonstration and proof of satisfactory tests. Leakers shall be rejected or repaired and retested. Containers not required to be tested with heads in place, except that samples taken at random and closed as for use of each type and size, must be tested at start of production and repeated every 4 months. Samples last tested to be retained until further tests are made or for 1 year, whichever period is shorter.

§ 178.111 Specification 42G; aluminum drums.

§ 178.111-1 Compliance.

(a) Required in all details.

§ 178.111-2 Rated capacity.

(a) Rated capacity as marked, see § 178.111-8(a)(3), 55 gallons; actual capacity shall be rated capacity plus at least 2 percent.

§ 178.111-3 Composition.

(a) Body and heads or drawn shells of aluminum alloy 5052, or an aluminum base alloy of equivalent corrosion resistance and physical properties.

§ 178.111-4 Outage.

(a) Two percent of rated capacity, plus a maximum tolerance of 2 quarts.

§ 178.111-5 Seams.

(a) Welded, including attachment of flanges for closures and other devices. Circumferential seam at least 3 inches from top of chime; chime seams not permitted.

§ 178.111-6 Parts and dimensions.

(a) At start of fabrication, aluminum alloy sheets shall have a minimum thickness of 0.102 inch and completed container shall have not wall thickness less than 0.081 inch.

(b) Rolled or swaged-in rolling hoops required.

(c) Footrings of suitable strength required and must be continuously welded around the outside periphery to the drum shell.

§ 178.111-7 Closures.

(a) Of screw-thread type or secured by screw-thread device; openings over 2.3 inches not authorized; suitable gaskets required.

(b) Threaded plugs, or caps, and flanges must be close fitting with gasket surfaces which bear squarely on each other when without gasket; they must have not over 12 threads per inch, with at least 3 threads engaged when gasket is in place; two $\frac{3}{16}$ -inch drainage holes are authorized in flange.

§ 178.111-8 Marking.

(a) Marking on each container on top head, by stamping with pressure dies, by embossing with raised marks, or plate attached by welding, as follows:

(1) DOT-42G.

(2) Name or symbol of person making the mark specified in paragraph (a)(1) of this section and located just above, below, or following that mark. Symbol, if used, must be registered with the Bureau of Explosives.

(3) Gauge of metal, Brown and Sharpe or equivalent decimal thickness in inches, at start of fabrication; rated capacity in gallons; year of manufacture (for example, 7-30-50 or 0.1442-30-50).

§ 178.111-9 Size of marking.

(a) Size of marking (minimum): $\frac{3}{4}$ -inch high.

§ 178.111-10 Type test.

(a) Samples taken at random and closed as for use, shall withstand prescribed tests without leakage. Tests to be made of each type and size by each company starting production and to be repeated every 4 months. Samples last tested to be retained until further tests are made or for 1 year, whichever period is shorter. The type tests are as follows:

(1) Test by dropping, filled with water to 98 percent capacity, from height of 4 feet onto solid concrete so as to strike diagonally on chime, or when without

chime seam. to strike on other circumferential seam; also additional tests on any other parts which might be considered weaker than the chime.

(2) Hydrostatic pressure test of 40 pounds per square inch sustained for 5 minutes.

§ 178.111-11 Leakage test.

(a) Each container shall be tested, unsupported, with seams under water or covered with soapsuds or heavy oil, by interior air pressure of at least 15 pounds per square inch. Leaking or damaged drums shall be rejected or repaired and retested.

§ 178.111-12 Defective containers.

(a) Leaks and other defects shall be repaired by welding, using welding material of the same composition as originally used by the manufacturer of the drum or other approved aluminum base alloy of equal corrosion and strength qualities.

§ 178.112 Specification 42H; aluminum drums; removable head containers not authorized

§ 178.112-1 Compliance.

(a) Required in all details.

§ 178.112-2 Rated capacity.

(a) Rated capacity as marked shall be 55 gallons, see § 178.112-10(a)(3). Minimum actual capacity of containers shall be not less than rated (marked) capacity plus 4 percent. Maximum actual capacity shall not be greater than rated (marked) capacity plus 5 percent.

§ 178.112-3 Composition.

(a) Body and heads shall be of aluminum alloy 5086-H32 or an aluminum base alloy of equivalent corrosion resistance and physical properties.

§ 178.112-4 Seams.

(a) Body seams welded.

(b) Head and chime seams welded or double-seamed.

§ 178.112-5 Chime reinforcement.

(a) Chime reinforcement required and shall be not less than 12-gauge galvanized steel commercial coating.

§ 178.112-6 Parts and dimensions.

(a) At start of fabrication, aluminum alloy sheets shall have a minimum thick-

ness of 0.063 inch and completed container shall have no wall thickness less than 0.059 inch.

(b) Rolled or swedged-in rolling hoops required.

(c) Drum shall be of straight side type.

§ 178.112-7 Convex heads.

(a) Convex (crowned) heads, not extending beyond level of chime; minimum convexity of three-eighths inch required.

§ 178.112-8 Defective containers.

(a) Leaks and other defects shall be repaired by welding, using welding material of the same composition as originally used by the manufacturer of the drum or other approved aluminum base alloy of equal corrosion and strength qualities.

§ 178.112-9 Closures.

(a) Of screw-thread type or secured by screw-thread device; openings over 2.3 inches not authorized; suitable gaskets required.

(b) Threaded plugs, or caps, and flanges must be close fitting with gasket surfaces which bear squarely on each other when without gasket; they must have not over 12 threads per inch, with at least 3 threads engaged when gasket is in place; two five-sixths inch drainage holes are authorized in flange.

§ 178.112-10 Marking.

(a) Marking on each container on head, by stamping with pressure dies, by embossing with raised marks, or plate attached by welding, as follows:

(1) DOT-42H.

(2) Name or symbol of person making the mark specified in paragraph (a)(1) of this section and located just above, below, or following that mark. Symbol, if used, must be registered with the Bureau of Explosives.

(3) Gauge of metal, decimal thickness in inches, at start of fabrication; rated capacity in gallons; year of manufacture (for example, 0.063-55-63).

§ 178.112-11 Size of marking.

(a) Size of marking (minimum); three-fourths inch high.

§ 178.112-12 Type tests.

(a) Samples, taken at random and closed as for use, shall withstand pre-

scribed tests without leakage. Tests to be made of each type and size by each company starting production and to be repeated every four months. Samples last tested to be retained until further tests are made or for one year, whichever period is shorter. The type tests are as follows:

(1) Test by dropping, filled with water to 98 percent capacity, from height of 4 feet onto solid concrete so as to strike diagonally on chime, or when without chime seam, to strike on other circumferential seam; also additional tests on any other parts which might be considered weaker than the chime.

(2) Hydrostatic pressure test of 40 pounds per square inch sustained for 5 minutes.

§ 178.112-13 Leakage test.

(a) Each container shall be tested, unsupported, with seams under water or covered with soapsuds or heavy oil, by interior air pressure of at least 15 pounds per square inch. Leaking or damaged drums shall be rejected or repaired and retested.

§ 178.115 Specification 17C; steel drums.

Single trip container. Removable head containers which will pass all required tests are authorized.

§ 178.115-1 Compliance.

(a) Required in all details.

§ 178.115-2 Rated capacity.

(a) Rated capacity as marked, see § 178.115-10(a)(3). Minimum actual capacity of containers shall be not less than rated (marked) capacity plus 4 percent. Maximum actual capacity shall not be greater than rated (marked) capacity plus 5 percent or rated (marked) capacity plus 4 percent plus 1 quart whichever is the greater.

§ 178.115-3 Composition

(a) Sheets for body and heads to be low carbon, open hearth or electric steel.

§ 178.115-5 Seams.

(a) Body seams welded.

§ 178.115-6 Parts and dimensions

(a) Parts and dimensions as follows:

Marked capacity not over (gallons)	Type of container	Minimum thickness, uncoated sheets (gauge)		Rolling hoops		
		Body sheet	Head sheet	Type	Minimum	
					Size (gauge or inch)	Weight (pounds per foot)
5 ¹	Straight side.....	24	24	None.....	.....	.....
10.....	do.....	20	20	do.....	.....	.....
30.....	do.....	18	18	(1).....	.....	.....
55.....	do.....	16	16	(1 ²).....	.....	.....

¹ Rolled or swedged in hoops.

² Each removable head drum body must have three rolled or swedged-in hoops with the centerline of one not more than 3 inches from the top curl.

³ A drum of 5¹/₄ gallons marked capacity is authorized for shipment of the commodity specified in § 173.353(d) of this chapter.

(b) Steel sheets of specified gauges shall comply with the following:

Gauge No.	Nominal thickness ¹ (inch)	Minimum thickness ¹ (inch)
16.....	0.0598	0.0533
18.....	.0478	.0428
30.....	.0359	.0324
24.....	.0239	.0209

¹ Thickness shall be measured at any point on the sheet not less than ³/₈ inch from an edge.

§ 178.115-7 Convex heads.

(a) Convex (crowned) heads, not extending beyond level of chime, required

for drums of 25 gallons capacity or over; minimum convexity of ³/₈ inch required.

§ 178.115-8 Closures.

(a) Adequate to prevent leakage; gaskets required.

(b) Closing part (plug, cap, plate, etc., see Note 1) must be of metal as thick as prescribed for head of container; this not required for containers of 12 gallons or less when the opening to be closed is not over 2.7 inches in diameter. If unthreaded cap is used it must be provided with outside sealing devices which cannot be removed without destroying the cap or sealing device.

NOTE 1: This does not apply to cap seal over a closure which complies with all requirements.

(c) For closure with threaded plug or cap, the seat (flange, etc.) for plug, or cap, must have 3 or more complete threads; two drainage holes of not over $\frac{3}{16}$ inch diameter are allowed. Plug, or cap, must have sufficient length of thread to engage 3 threads when screwed home with gasket in place. Threaded closures having fewer threads are authorized for containers having a capacity of 12 gallons or less when such closures are approved by the Bureau of Explosives upon proof of satisfactory tests.

(1) Closures of screw-thread type or closed by other positive means, of any material or design, may be authorized for use, upon satisfactory proof of efficiency.

(d) Full removable head drums over 5 gallons capacity must be closed by means of 12 gauge bolted ring with drop forged lugs, one of which is threaded, and having $\frac{3}{8}$ inch bolt and nut for drums not over 30 gallons capacity and $\frac{5}{8}$ inch bolt and nut for drums over 30 gallons capacity. Five gallon drums must be of lug type closure with cover having at least 16 lugs. Equally efficient types of closures are authorized upon demonstration and proof of satisfactory tests.

§ 178.115-9 Defective containers.

(a) Leaks and other defects to be repaired by method used in constructing container, not by soldering.

§ 178.115-10 Marking.

(a) Marking on each container by embossing on head except that such embossment must be on the permanent head for drums having removable heads, with raised marks, or by embossing or die stamping on footring on drums equipped with footrings, or on metal plates securely attached to drum by brazing or welding not less than 20 percent of the perimeter, as follows:

(1) DOT-17C. The letters STC; located near the DOT mark to indicate "single-trip container." In addition, when the container is of stainless steel, the type of steel used in body and head sheets as identified by American Iron and Steel Institute type number, and also the letters HT following steel designation on containers subjected to stress-

relieving or heat-treatment during manufacture (for example, DOT-17C-304 or DOT-17C-304 HT as applicable) shall be shown.

(2) Name or symbol of person making the marks specified in paragraph (a) (1) of this section. Symbol, if used, must be registered with the Bureau of Explosives.

(3) Gauge of metal in thinnest part, rated capacity in gallons, and year of manufacture (for example, 14-55-50). When gauge of metal in body differs from that in head, both must be indicated with slanting line between and with gauge of body indicated first (for example 14/12-55-50 for body 14 gauge and head 12 gauge).

§ 178.115-11 Size of markings.

(a) Size of markings (minimum): $\frac{1}{2}$ " high for 33 gallons or less, $\frac{3}{4}$ " for over 33 and not over 55 gallons.

§ 178.115-12 Type tests.

(a) Samples taken at random and closed as for use, shall withstand prescribed tests without leakage. Tests to be made of each type and size by each company starting production and to be repeated every 4 months. Samples last tested to be retained until further tests are made or for 1 year, whichever period is shorter. The type tests are as follows:

(1) Test by dropping, filled with water to 98 percent capacity, from height of 4 feet onto solid concrete so as to strike diagonally on chime, or when without chime seam, to strike on other circumferential seam; also additional drop test on any other parts which might be considered weaker than the chime. Closing devices and other parts projecting beyond chime or rolling hoops must also be capable of withstanding this test.

(2) Hydrostatic pressure test of 40 pounds per square inch sustained for 5 minutes; except that full removable head drums must sustain 20 pounds per square inch.

§ 178.115-13 Leakage test.

(a) Each container shall be tested, with seams under water or covered with soapsuds or heavy oil, by interior air pressure of at least 15 pounds per square

inch. Equally efficient means of testing are authorized upon demonstration and proof of satisfactory tests. Leakers shall be rejected or repaired and retested. Removable head containers not required to be tested with heads in place except that samples taken at random and closed as for use, of each type and size, must be tested at start of production and repeated every 4 months. Samples last tested to be retained until further tests are made or for 1 year, whichever period is shorter.

§ 178.116 Specification 17E: steel drums.

Single trip container. Removable head containers not authorized.

§ 178.116-1 Compliance.

(a) Required in all details.

Marked capacity not over (gallons)	Type of container	Minimum thickness, uncoated sheets (gauge)		Rolling hoops		
		Body sheet	Head sheet	Type	Minimum	
					Size (gauge or inch)	Weight (pounds per foot)
5.....	Straight side.....	24	24	None.....		
10.....	do.....	22	22	do.....		
30.....	do.....	19 ¹	19 ¹	(¹)		
55.....	do.....	18 ²	18	(¹)		

¹ Rolled or swedged in hoops.

² 20 gauge authorized.

(b) Steel sheets of specified gauges shall comply with the following:

Gauge No.	Nominal thickness ¹ (inch)	Minimum thickness ¹ (inch)
18.....	0.0478	0.0428
19.....	.0418	.0378
20.....	.0359	.0324
22.....	.0299	.0269
24.....	.0239	.0209

¹ Thickness shall be measured at any point on the sheet not less than $\frac{1}{4}$ inch from an edge.

§ 178.116-7 Convex heads.

(a) Convex (crowned) heads, not extending beyond level of chime, required for drums of 25 gallons capacity or over. Convexity to be minimum of $\frac{3}{8}$ ".

§ 178.116-2 Rated capacity

(a) Rated capacity as marked, see § 178.116-10(a)(3). Minimum actual capacity of containers shall be not less than rated (marked) capacity plus 4 percent. Maximum actual capacity shall not be greater than rated (marked) capacity plus 5 percent or rated (marked) capacity plus 4 percent plus 1 quart whichever is the greater.

§ 178.116-3 Composition.

(a) Sheets for body and heads to be low carbon, open hearth or electric steel.

§ 178.116-5 Seams.

(a) Body seams welded.

§ 178.116-6 Parts and dimensions

(a) Parts and dimensions as follows:

§ 178.116-8 Closures.

(a) Adequate to prevent leakage; gaskets required.

(b) Closing part (plug cap plate etc., see Note 1) must be of metal as thick as prescribed for head of container: *Provided*, That thinner metal closures or closures of other material are authorized for containers of 12 gallons capacity or less when opening to be closed is not over 2.7 inches in diameter and closures, except threaded metal closures, are fitted with outside sealing devices which cannot be removed without destroying the closure or sealing device (see paragraph (d) of this section).

NOTE 1: This does not apply to cap seal over a closure which complies with all requirements.

(c) For closure with threaded plug or cap, the seat (flange, etc.) for plug, or cap, must have 3 or more threads; two

drainage holes of not over $\frac{5}{16}$ inch diameter are allowed. Plug, or cap, must have sufficient length of thread to engage 3 threads when screwed home with gasket in place: *Provided*, That for containers having a capacity of 12 gallons and less the seat (flange, etc.) for plug, or cap, must have two or more complete threads and plug, or cap, must have sufficient length of thread to engage two threads when screwed home with gasket in place.

(d) Closures of screw-thread type or closed by positive means, of any material or design, may be authorized for use, upon satisfactory proof of efficiency.

§ 178.116-9 Defective containers.

(a) Leaks and other defects to be repaired by method used in constructing container, not by soldering.

§ 178.116-10 Marking.

(a) Marking on each container by embossing on head with raised marks, or by embossing or die stamping on footring on drums equipped with foot-rings, or on metal plates securely attached to drum by brazing or welding not less than 20 percent of the perimeter as follows:

(1) DOT-17E. The letters STC; located near the DOT mark to indicate "single-trip container." In addition, when the container is of stainless steel, the type of steel used in body and head sheets as identified by American Iron and Steel Institute type number, and also the letters HT following steel designation on containers subjected to stress-relieving or heat-treatment during manufacture (for example, DOT-17E-304 or DOT-17E-304 HT as applicable) shall be shown.

(2) Name or symbol of person making the marks specified in paragraph (a) (1) of this section. Symbol, if used, must be registered with the Bureau of Explosives

(3) Gauge of metal in thinnest part, rated capacity in gallons, and year of manufacture (for example, 12-55-50). When gauge of metal in body differs from that in head, both must be indicated with slanting line between and with gauge of body indicated first (for example 14/12-55-50 for body 14 gauge and head 12 gauge).

§ 178.116-11 Size of markings.

(a) Size of markings (minimum): $\frac{1}{2}$ " high for 33-gallon or less, $\frac{3}{4}$ " for over 33 and not over 55 gallons.

§ 178.116-12 Type tests.

(a) Samples taken at random and closed as for use, shall withstand prescribed tests without leakage. Tests to be made of each type and size by each company starting production and to be repeated every 4 months. Samples last tested to be retained until further tests are made or for 1 year, whichever period is shorter. The type tests are as follows:

(1) Test by dropping, filled with water to 98 percent capacity, from height of 4 feet onto solid concrete so as to strike diagonally on chime, or when without chime seam, to strike on other circumferential seam; also additional drop test on any other parts which might be considered weaker than the chime. Closing devices and other parts projecting beyond chime or rolling hoops must also be capable of withstanding this test.

(2) Hydrostatic pressure test of 15 pounds per square inch sustained for 5 minutes.

§ 178.116-13 Leakage test.

(a) Each container shall be tested, with seams under water or covered with soapsuds or heavy oil, by interior air pressure of at least 7 pounds per square inch for containers over 12 gallons capacity and at least 5 pounds for others. Equally efficient means of testing are authorized upon demonstration and proof of satisfactory tests. Leakers shall be rejected or repaired and retested.

§ 178.117 Specification 17F; steel drums.

Single trip container. Removable head containers not authorized.

§ 178.117-1 Compliance.

(a) Required in all details.

§ 178.117-2 Rated capacity.

(a) Rated capacity as marked, see § 178.117-11(a)(3). Actual capacity of containers shall be not less than rated (marked) capacity plus 2 percent, nor

greater than rated capacity plus 2 percent plus 1 quart, except that for containers over 30 gallons marked capacity actual capacity shall be not less than rated capacity plus 2 percent, nor greater than rated capacity plus 2 percent plus 2 quarts.

§ 178.117-3 Composition.

(a) Sheets for body and heads to be low carbon, open hearth or electric steel. Steel to be as high as practicable in tensile strength, having no loose oxide or scale.

§ 178.117-5 Seams.

- (a) Body seams welded.
- (b) Head and chime seams welded or double-seamed.
- (c) Flanges for closures welded in place.

§ 178.117-6 Chime reinforcement.

- (a) Chime reinforcement required to be not less than 12 gauge (see § 178.117-7 (b)).

§ 178.117-7 Parts and dimensions.

- (a) Parts and dimensions as follows.

Marked capacity not over (gallons)	Type of container	Minimum thickness, uncoated sheets (gauge)		Rolling hoops		
				Type	Minimum	
		Body sheet	Head sheet		Size	Weight
55.....	Straight side.....	16	16	(1)	-----	-----

¹ Rolled or swaged-in hoops Use of I-bar hoops authorized.

(b) Steel sheets of specified gauges shall comply with the following:

Gauge No.	Nominal thickness ¹ (inch)	Minimum thickness ¹ (inch)
12.....	0.1046	0.0946
16.....	.0598	.0533

¹ Thickness shall be measured at any point on the sheet not less than $\frac{3}{8}$ inch from an edge.

§ 178.117-8 Rolling hoops and convex heads.

(a) *Rolling hoops.* Rolling hoops to be expanded. Alternate use of I-bar hoops authorized.

(b) *Convex heads.* Convex (crowned) heads; minimum convexity to be $\frac{3}{8}$ inch, with minimum chime height of $\frac{7}{8}$ inch.

§ 178.117-9 Closures.

(a) Adequate to prevent leakage; gaskets required.

(b) Closing part (plug, cap, plate, etc., see Note 1) must be of metal as thick as prescribed for head of container; this not required for containers of 12 gallons or less when the opening to be closed is not over 2.3 inches in diameter. If unthreaded cap is used it must be provided with outside sealing devices which cannot be removed without destroying the cap or sealing device.

NOTE 1: This does not apply to cap seal over a closure which complies with all requirements.

(c) Closure must be of screw-thread type or fastened by screw-thread device.

(d) One opening not over 2.3 inches and one opening not over $\frac{3}{4}$ inch allowed; both openings to be welded in one head only. Threads to be standard pipe thread of 11 threads per inch for the larger opening and 14 threads per inch for the $\frac{3}{4}$ -inch opening.

§ 178.117-10 Defective containers.

(a) Leaks and other defeats to be repaired by method used in constructing container, not by soldering.

§ 178.117-11 Marking.

(a) Marking on each container by embossing on head with raised marks, or by embossing or die stamping on foot-rings on drums equipped with foot-rings, or on metal plates securely attached to drum by brazing or welding not less than 20 percent of the perimeter as follows:

(1) DOT-17F. The letter STC; located near the DOT mark to indicate "single-trip container." In addition, when the container is of stainless steel, the type of steel used in body and head sheets as identified by American Iron and Steel Institute type number, and also

the letters HT following steel designation on containers subjected to stress-relieving or heat-treatment during manufacture (for example, DOT-17F-304 or DOT-17F-304 HT as applicable) shall be shown.

(2) Name or symbol of person making the marks specified in paragraph (a)(1) of this section. Symbol, if used, must be registered with the Bureau of Explosives.

(3) Gauge of metal in thinnest part, rated capacity in gallons, and year of manufacture (for example, 12-55-50).

§ 178.117-12 Size of markings.

(a) Size of markings (minimum): $\frac{1}{2}$ " high for 33-gallon or less, $\frac{3}{4}$ " for over 33 and not over 55 gallons.

§ 178.117-13 Type tests.

(a) Samples taken at random and closed as for use, shall withstand prescribed tests without leakage. Tests to be made of each type and size by each company starting production and to be repeated every 4 months. Samples last tested to be retained until further tests are made or for 1 year, whichever period is shorter. The type tests are as follows:

(1) Test by dropping, filled with water to 98 percent capacity, from height of 6 feet onto solid concrete so as to strike diagonally on chime, or when without chime seam, to strike on other circumferential seam; also additional drop test on any other parts which might be considered weaker than the chime. Closing devices and other parts projecting beyond chime or rolling hoops must also be capable of withstanding this test.

(2) Hydrostatic pressure test of 80 pounds per square inch sustained for 5 minutes.

§ 178.117-14 Leakage test.

(a) Each container shall be tested, with seams under water or covered with soapsuds or heavy oil, by interior air pressure of at least 15 pounds per square inch. Equally efficient means of testing are authorized upon demonstration and proof of satisfactory tests. Leakers shall be rejected or repaired and retested.

§ 178.118 Specification 17H; steel drums.

Single-trip container. Removable head required.

§ 178.118-1 Compliance.

(a) Required in all details.

§ 178.118-2 Rated capacity.

(a) Rated capacity as marked, see § 178.118-10(a)(3). Minimum actual capacity of containers shall be not less than rated (marked) capacity plus 4 percent. Maximum actual capacity shall not be greater than rated (marked) capacity plus 5 percent or rated (marked) capacity plus 4 percent plus 1 quart whichever is the greater.

§ 178.118-3 Composition.

(a) Sheets for body and heads to be low carbon, open hearth or electric steel.

§ 178.118-5 Seams.

(a) Body seams welded.

§ 178.118-6 Parts and dimensions.

(a) Parts and dimensions as follows:

Marked capacity not over (gallons)	Type of container	Minimum thickness, uncoated sheets (gauge)			Rolling hoops		
		Body sheet	Bottom head sheet	Removable head sheet	Type	Minimum	
						Size (gauge or inch)	Weight (pounds per foot)
5.....	Straight side.....	24	24	20	None	.....	.....
30.....	do.....	18	18	18	(1)	.....	.....
55.....	do.....	18	18	14	(2)	.....	.....

¹ Rolled or swedged in hoops.

² Each drum must have three rolled or swedged in hoops, one to be placed in the body near the top curl.

³ 16 gauge authorized provided there are one or more corrugations in the cover near the periphery.

(b) Steel sheets of specified gauge shall comply with the following:

Gauge No.	Nominal thickness ¹ (inch)	Minimum thickness ¹ (inch)
14.....	0.0747	0.0677
16.....	.0598	.0533
18.....	.0478	.0428
20.....	.0359	.0324
24.....	.0239	.0209

¹ Thickness shall be measured at any point on the sheet not less than $\frac{1}{4}$ inch from an edge.

§ 178.118-7 Convex heads.

(a) Convex (crowned) heads, not extending beyond level of chime, required for drums of 25 gallons capacity or over; minimum convexity of $\frac{3}{8}$ inch required.

§ 178.118-8 Closures.

(a) Adequate to prevent leakage; gaskets required.

(b) Drums over 5 gallons capacity must be closed by means of 12 gauge bolted ring with drop forged lugs, one of which is threaded, and having $\frac{3}{8}$ inch bolt and nut for drums not over 30 gallons capacity and $\frac{5}{8}$ inch bolt and nut for drums over 30 gallons capacity. Five gallon drums must be of lug type closure with cover having at least 16 lugs. Equally efficient types of closures are authorized upon demonstration and proof of satisfactory tests.

(c) For closure with threaded plug or cap, the seat (flange, etc.) for plug, or cap, must have 3 or more threads; two drainage holes of not over $\frac{3}{16}$ inch diameter are allowed. Plug, or cap, must have sufficient length of thread to engage 3 threads when screwed home with gasket in place: *Provided*, That for containers having a capacity of 12 gallons and less the seat (flange, etc.) for plug, or cap, must have two or more complete threads and plug, or cap, must have sufficient length of thread to engage two threads when screwed home with gasket in place.

(1) Closures of screw-thread type or closed by other positive means, of any material or design, may be authorized for use, upon satisfactory proof of efficiency.

§ 178.118-9 Defective containers.

(a) Leaks and other defects to be repaired by method used in constructing container, not by soldering.

§ 178.118-10 Marking.

(a) Marking on each container by embossing on head, except that such embossment must be on the permanent head for drums having removable heads, with raised marks, or by embossing or die stamping on footring on drums equipped with footrings, or on metal plates securely attached to drum by brazing or welding not less than 20 percent of the perimeter, as follows:

(1) DOT-17H. The letters STC; located near the DOT mark to indicate "single-trip container." In addition, when the container is of stainless steel, the type of steel used in body and head sheets as identified by American Iron and Steel Institute type number, and also the letters HT following steel designation on containers subjected to stress-relieving or heat-treatment during manufacture (for example, DOT-17H-304 or DOT-17H-304 HT as applicable) shall be shown.

(2) Name or symbol of person making the marks specified in paragraph (a) (1) of this section. Symbol, if used, must be registered with the Bureau of Explosives.

(3) Gauge of metal in thinnest part, rated capacity in gallons, and year of manufacture (for example, 12-55-50). When gauge of metal in body differs from that in head, both must be indicated with slanting line between and with gauge of body indicated first (for example 14/12-55-50 for body 14 gauge and head 12 gauge).

§ 178.118-11 Size of markings.

(a) Size of markings (minimum): $\frac{1}{2}$ " high for 33-gallon or less, $\frac{3}{4}$ " for over 33 and not over 55 gallons.

§ 178.118-12 Type tests.

(a) Samples taken at random and closed as for use, shall withstand prescribed tests without leakage. Tests to be made of each type and size by each

company starting production and to be repeated every 4 months. Samples last tested to be retained until further tests are made or for 1 year, whichever period is shorter. The type tests are as follows:

(1) Test by dropping, filled with water to 98 percent capacity, from height of 4 feet onto solid concrete so as to strike diagonally on chime, or when without chime seam, to strike on other circumferential seam; also additional drop test on any other parts which might be considered weaker than the chime. Closing devices and other parts projecting beyond chime or rolling hoops must also be capable of withstanding this test.

(2) Hydrostatic pressure test of 15 pounds per square inch sustained for 5 minutes.

§ 178.118-13 Leakage test.

(a) Each container shall be tested, with seams under water or covered with soapsuds or heavy oil, by interior air pressure of at least 7 pounds per square inch for containers over 12 gallons capacity and at least 5 pounds for others. Equally efficient means of testing are authorized upon demonstration and proof of satisfactory tests. Leakers shall be rejected or repaired and retested. Containers not required to be tested with heads in place except that samples taken

at random and closed as for use, of each type and size, must be tested at start of production and repeated every four months. Samples so tested must be retained until further tests are made.

§ 178.119 Specification 17X; steel barrels or drums.

Single trip container. Removable head containers not authorized.

§ 178.119-1 Compliance.

(a) Required in all details.

§ 178.119-2 Rated capacity.

(a) Rated capacity as marked, see § 178.119-70(a)(3). Minimum actual capacity of containers shall not be less than rated (marked) capacity plus 4 percent. Maximum actual capacity shall not be greater than rated (marked) capacity plus 5 percent or rated (marked) capacity plus 4 percent plus 1 quart whichever is the greater.

§ 178.119-3 Composition.

(a) Sheets for body and heads to be low carbon, open hearth or electric steel.

§ 178.119-5 Seams.

(a) Body seams welded.

(b) Head and chime seams welded or double-seamed.

§ 178.119-6 Parts and dimensions.

(a) Parts and dimensions as follows:

Marked capacity not over (gallons).....	30.....	55.....
Type of container.....	Straight side.....	Straight side.....
Minimum thickness, uncoated sheets ¹	Body sheet: 19 ²	Body sheet: 18 ²
Gauge.....	Head sheet: 19 ²	Head sheet: 18 ²
Type of rolling hoops.....	Rolled or swedged in hoops.....	Rolled or swedged in hoops.....

¹ Thickness shall be measured at any point on the sheet not less than $\frac{3}{4}$ inch from an edge.

² 19 gauge steel shall have nominal thickness of 0.0418 inch and minimum thickness of 0.0378 inch.

³ 18 gauge steel shall have nominal thickness of 0.0478 inch and minimum thickness of 0.0428 inch.

§ 178.119-7 Flat or convexed heads.

(a) When heads are convexed (crowned) they shall not extend within $\frac{1}{4}$ inch of the chime level; maximum convexity $1\frac{1}{32}$ inch for 55-gallon drums.

§ 178.119-8 Closures.

(a) Adequate to prevent leakage; gaskets required. Closure must be of screw-thread type or fastened by screw-thread device.

(b) Closing part (plug, cap, plate, etc., see Note 1) must be of metal as thick as

prescribed for head of container; this not required for containers of 12 gallons or less when the opening to be closed is not over 2.3" diameter and the closing part is constructed, or fitted with sealing device, so that it cannot be removed without destroying it or the sealing device.

NOTE 1: This does not apply to a cap seal over a closure when closure complies with all requirements.

(c) For closure with threaded plug or cap, the seat (flange, etc.) for plug, or

cap, must have 3 or more complete threads; two drainage holes of not over $\frac{3}{16}$ " diameter are allowed only in flanges having at least 5 threads. Plug, or cap, must have sufficient length of thread to engage 3 threads when screwed home with gasket in place.

§ 178.119-9 Defective containers.

(a) Leaks and other defects to be repaired by method used in constructing containers, not to be soldered.

§ 178.119-10 Marking.

(a) Marking on each container by embossing on head with raised marks as follows:

(1) DOT-17X. The letters STC; located near the DOT mark to indicate "single-trip container." In addition, when the container is of stainless steel, the type of steel used in body and head sheets as identified by American Iron and Steel Institute type number, and also the letters HT following steel designation on containers subjected to stress-relieving or heat-treatment during manufacture (for example, DOT-17X-304 or DOT-17X-304 HT as applicable) shall be shown.

(2) Name or symbol of person making the marks specified in paragraph (a) (1) of this section. Symbol, if used, must be registered with the Bureau of Explosives.

(3) Gauge of metal in thinnest part, rated capacity in gallons, and year of manufacture (for example, 18-55-50).

(4) Steel barrels or drums manufactured prior to March 31, 1941, which are in compliance with this specification except as to marking may be accepted as permitted by § 173.22 of this chapter without necessity of having the marking embossed on the head in raised letters. This shipping paper shall, however, certify that the drum is in compliance.

§ 178.119-11 Size of markings.

(a) Size of markings (minimum): $\frac{3}{4}$ inch high.

§ 178.119-12 Type tests.

(a) Samples taken at random and closed as for use, shall withstand pre-

scribed tests without leakage. Tests to be repeated every 4 months. Samples last tested to be retained until further tests are made or for 1 year, whichever period is shorter. The type tests are as follows:

(1) Test by dropping filled with water to 98 percent capacity from height of 4 feet onto solid concrete, so as to strike diagonally on chime seam; also additional drop test on any other parts which might be considered weaker than the chime. Closing devices and other parts projecting beyond chime or rolling hoops must also be capable of withstanding this test.

(2) Hydrostatic pressure test of 15 pounds per square inch sustained for 5 minutes.

§ 178.119-13 Leakage test.

(a) Each container shall be tested, with seams under water or covered with soapsuds or heavy oil, by interior air pressure of at least 7 pounds per square inch. Equally efficient means of testing are authorized upon demonstration and proof of satisfactory tests. Leakers shall be rejected or repaired and retested.

§ 178.120 Specification 20PF phenolic-foam insulated, metal overpack.

§ 178.120-1 General requirements.

(a) Each overpack must meet all of the applicable requirements of § 173.24 of this subchapter.

(b) The maximum gross weight of the package, including the inner cylinder and its contents, must not exceed the following:

(1) Specification 20PF-1—138 kilograms (300 pounds).

(2) Specification 20PF-2—320 kilograms (700 pounds).

(3) Specification 20PF-3—455 kilograms (1000 pounds).

(c) The general configuration of the overpack must be a right cylinder, consisting of an insulated base section, a steel liner lid, and an insulated top section. The inner liner and outer shell must be at least 16-gauge and 18-gauge steel, respectively, with the intervening

cavity filled with a molded-in-place, fire-resistant, phenolic-foam insulation interspersed with wooden members for bracing and support. Wood pieces must be securely attached to both the liner and shell. No hole is permitted in the liner. Each joint between sections must be stepped a minimum of 5 centimeters (2 inches) and gaps between mating surfaces must not exceed 5 millimeters (0.2-inch). Gaps between foam surface of top section and liner lid must not exceed 1 centimeter (0.4-inch) or 5-centimeters (2 inches) where taper is required for mold stripping. For the specification 20PF-1, the top section may consist of a plug of foam insulation and a steel cover. The liner and shell closures must each be gasketed against moisture penetration. The liner must have a bolted flange closure. Shell closure must conform to § 178.118-8(b).

(d) Drawings in CAPE-1662, which include bills of material are a part of this specification.

§ 178.120-2 Materials of construction and other requirements.

(a) Phenolic foam—Insulation must be fire-resistant, phenolic foam which has been fabricated in accordance with USAEC Material and Equipment Specification SP-9, which is a part of this specification. A 13.7 centimeter (5-inch) minimum thickness of foam must be provided over the entire liner except:

(1) Where wood spacers replace the foam; or

(2) At protrusions of liner or shell, such as flanges, baffles, etc., where minimum insulation thickness is 9 centimeters (3.5 inches); or

(3) Where alternate top section (specification 20PF-1) is used. Foam must not interfere with proper seating of screws in inner liner flange assembly. Average density of insulation must be 0.13 g/cc (8 pounds per cubic foot (pcf)) minimum for bottom section and 0.16 g/cc (10 pcf) minimum for top section, except 0.1 g/cc (6.5 pcf) for the specification 20PF-1 top section.

(b) Gaskets must be as follows:

(1) Inner liner flange—Neoprene rubber of 30 to 60 type A durometer hardness or other equivalent gasket material

which is compatible with the specific contents.

(2) Outer shell—Synthetic rubber conforming to MIL-R-6855 (available from the Naval Publications Forms Center, 5801 Tabor Avenue, Philadelphia, Pennsylvania 19120) class 2, grade 60.

(3) Support and pressure pads for inner liner top and bottom must be sponge rubber or equivalent.

(c) Alternate top section (specification 20PF-1 only). Average insulation density must be 0.16 g/cc (10 pcf minimum). Thickness of plug must be 11 centimeters (4.3 inches) minimum, except thickness may be reduced to 10 centimeters (4 inches) to clear bolt heads. A flush mounted top lifting device must be securely fastened to a wood block encapsulated by the foam.

(d) Vent holes 5 millimeters (0.2-inch) diameter must be drilled in the outer shell to provide pressure relief during the insulation foaming and in the event of a fire. These holes, which must be drilled in all areas of the shell which mate with the foam insulation, must be spaced in accordance with CAPE-1662.

(e) Welding must be by a fusion welding process in accordance with American Welding Society Codes B-3.0 and D-1.0. Body seams and joints for the liner or shell must be continuous welds.

(f) Waterproofing—Each screw hole in the outer shell must be sealed with appropriate resin-type or equivalent sealing material during installation of the screw. All exposed foam surfaces, including any vent hole, must be sealed with waterproofing material as prescribed in USAEC Specification SP-9, Rev. 1, or equivalent.

§ 178.120-3 Tests.

(a) Leakage test—Each inner liner assembly must be tested for leakage prior to installation. Seam welds of the liner must be covered for a distance of at least 15 centimeters (6 inches) on either side of the seam with soapsuds, heavy oil, or equivalent material, and interior air pressure applied to at least 776mm Hg (15 p.s.i.g.) above atmospheric pressure must be held for at least 30 seconds. Liners failing to pass this test

may not be used until repairs are made, and retests successfully passed.

§ 178.120-4 Required markings.

(a) Marking must be as prescribed in § 173.24 of this subchapter.

(b) Marking on the outside of each overpack must be as follows:

(1) "USA-DOT-20FP-1" or "-2," as appropriate, and if the entire liner is

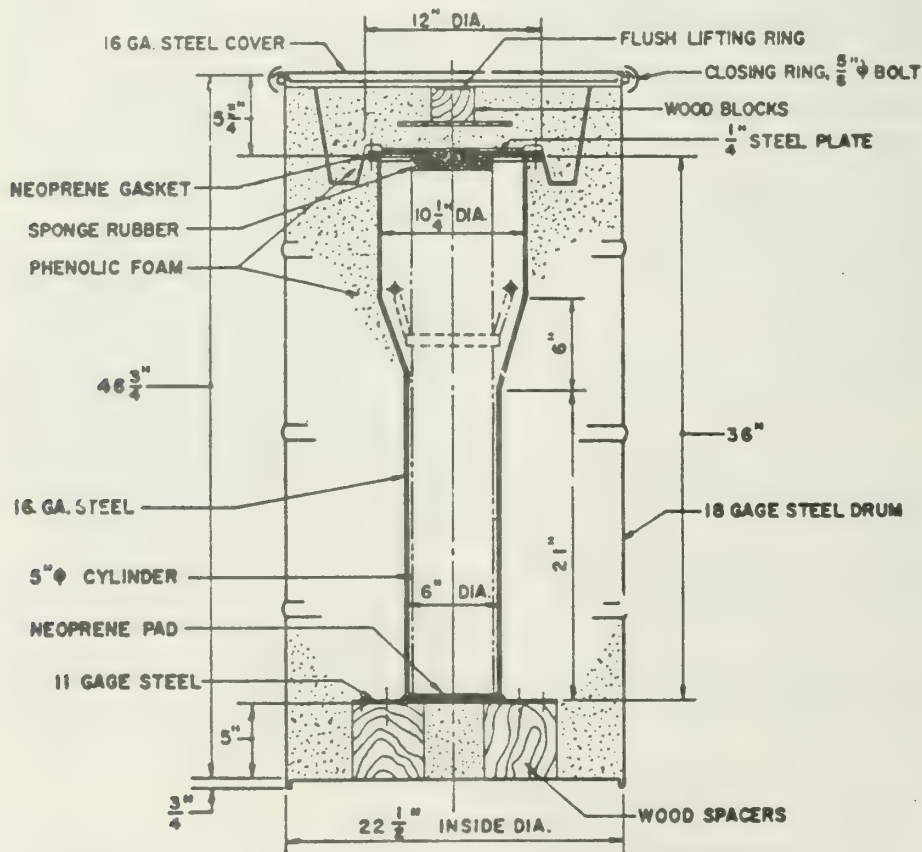
made of stainless steel, additional marking such as "3041-SS" to indicate the type of stainless steel used.

(2) "TARE WT: xxx lbs." where xxx is the tare weight of the assembled overpack without the inner container.

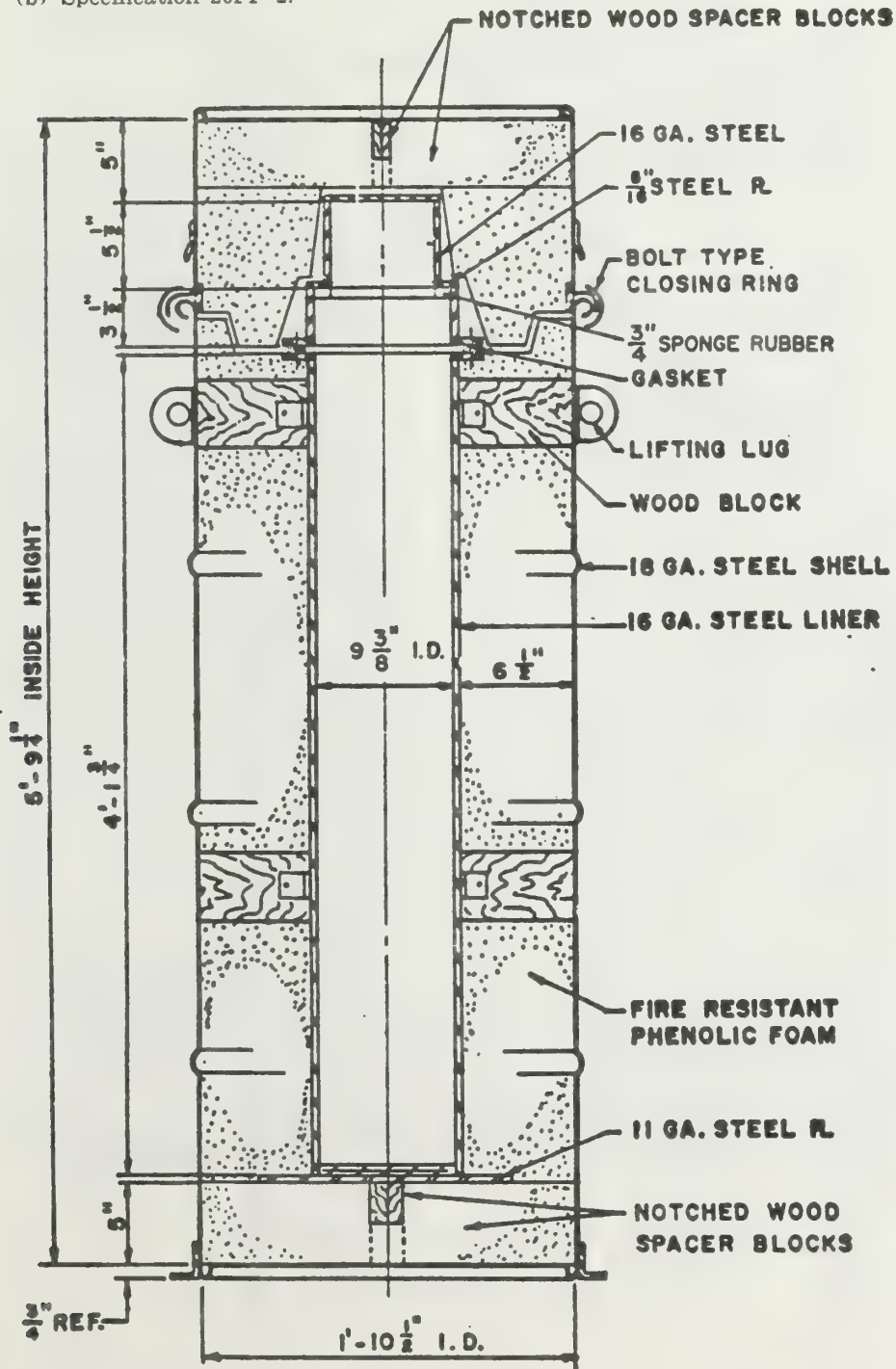
(3) Year of manufacture.

§ 178.120-5 Typical assembly detail.

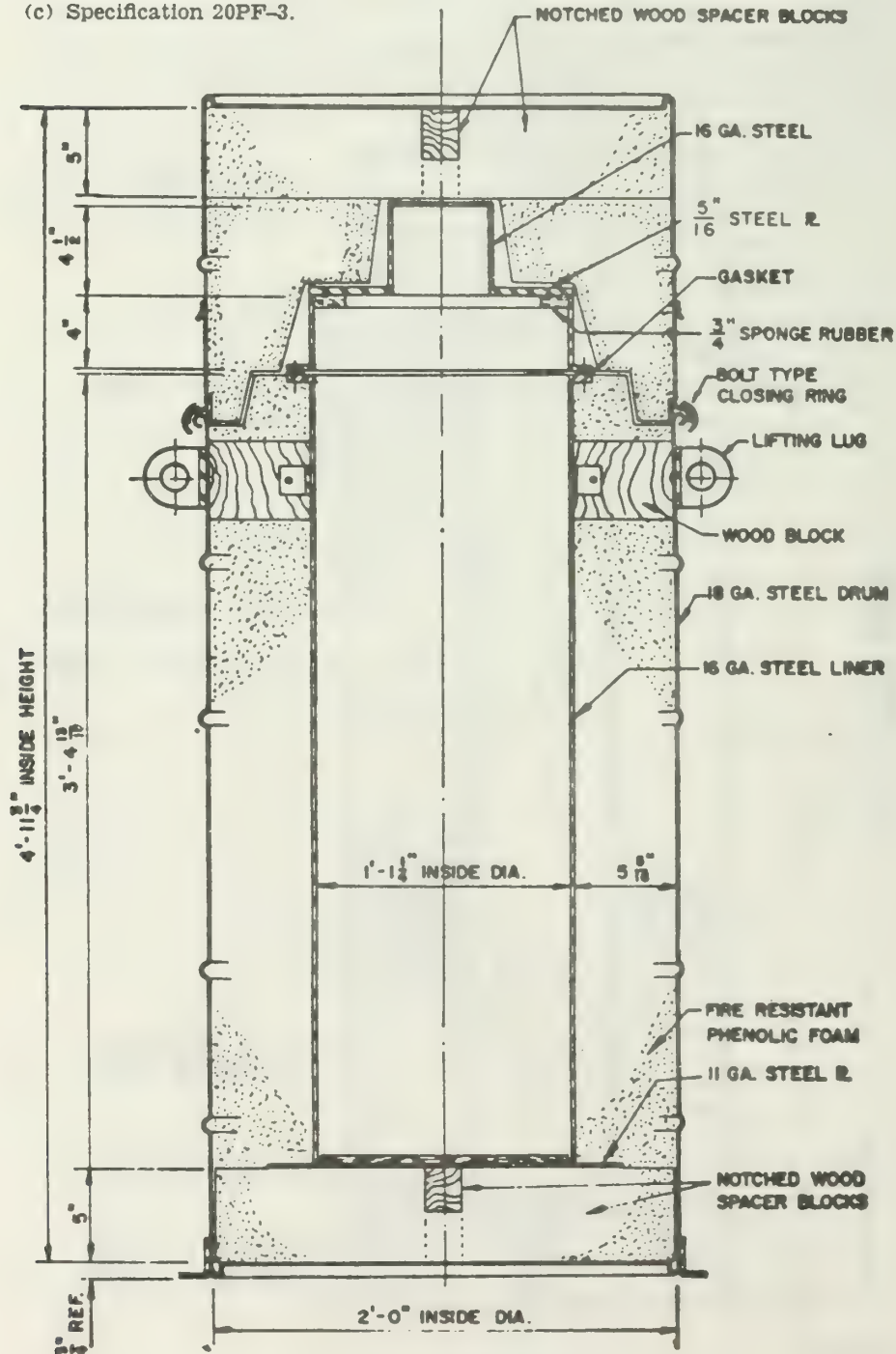
(a) Specifications 20PF-1.



(b) Specification 20PF-2.



(c) Specification 20PF-3.



§ 178.121 Specification 21PF fire and shock resistant, phenolic-foam insulated, metal overpack.

§ 178.121-1 General requirements.

(a) Each overpack must meet all of the applicable requirements of § 173.24 of this subchapter.

(b) Each overpack is authorized for use in applications where the maximum gross weight of the package, including the inner container and contents does not exceed 3725 kilograms (8200 pounds), (horizontally-loaded specification 21 PF-1 unit), or 3900 kilograms (8600 pounds), (end-loaded specification 21 PF-2 unit).

(c) The general configuration of the overpack must be a right cylinder, consisting of a steel inner liner (at least 16-gauge) and steel outer shell (at least 14-gauge) with the intervening cavity filled with a molded-in-place, fire-resistant, phenolic foam insulation and interspersed wooden members for bracing and support. Two specific configurations are authorized; a horizontal loading unit (specification 21PF-1) consisting of insulated base and top sections jointed in a longitudinal peripheral closure joint; or an end-loading unit (specification 21PF-2), consisting of an insulated main section, a steel plate liner lid, and an insulated end cap. For either type each joint between sections must be stepped at least 1.8 centimeters (0.75-inch) and gaps between mating surfaces may not exceed 5 millimeters (0.2-inch). Bolted closures, which must each be gasketed against moisture penetration, must be in accordance with CAPE-1662. Each bolt must be equipped with a locking device to prevent loosening from vibration. Outer steel bracing and support framework must be attached to the shell to facilitate normal handling.

(d) Drawings in CAPE-1662, which include bills of materials, are a part of this specification.

§ 178.121-2 Materials of construction and other requirements.

(a) *Phenolic foam.* Insulation must be fire resistant, phenolic foam which has been fabricated in accordance with USAEC material specification SP-9, Rev. 1, which is a part of this specification. A 14 centimeters (5.5-inch) minimum thickness of foam must be provided over the entire liner, except where:

(1) Wood spacers replace the foam material; or

(2) At protrusions of liner or shell, such as flanges, baffles, etc., where the minimum thickness of foam, wood, or a combination of these is 10 centimeters (4 inches).

(3) Solid wood or laminated wood solidly glued may be used to replace the foam between liner and shell (i.e., in ends of overpack). In this case, minimum wood thickness is 10 centimeters (4 inches). Average density of insulation must be 0.1g/cc (6.75 pounds per cubic foot (pcf)) minimum, except that 0.13 g/cc (8 pcf) is required in the removable end cap of the specification 21PF-2, which must have a minimum foam thickness of 12.7 centimeters (5 inches).

(b) Gaskets for inner liner, outer shell, or where otherwise specified in CAPE-1662, must be of vinyl foam tape, single coated, or 6 millimeters (¼-inch) thick expanded rubber, per ASTM D1056, type R or S, grades 41 to 43, with adhesive backing, or equivalent.

(c) Support and pressure pads for the inner liner must be of neoprene, sponge rubber, or equivalent.

(d) Fire retardant (intumescent) paint must be applied to any wood blocking which is located at any joint in the shell.

(e) Vent holes 5 millimeters (0.2-inch) diameter must be drilled in the outer shell to provide pressure relief during the insulation foaming and in the event of a fire. These holes, which must be drilled in all areas of the shell which made with the foam insulation, must be spaced in accordance with CAPE-1662.

(f) Welding must be by a fusion process in accordance with the American

Welding Society Code. Body seams and joints for the liner and shell must be continuous welds.

(g) Waterproofing. Each screw hole in the outer shell must be sealed with appropriate resin-type or equivalent sealing material during installation of the screw. All exposed foam surfaces including any vent hole, must be sealed with waterproofing material as prescribed in USAEC Material and Equipment Specification SP-9, or equivalent.

§ 178.121-3 Required markings.

(a) Markings must be as prescribed in § 173.24 of this subchapter.

(b) Marking on the outside of each overpack must be as follows:

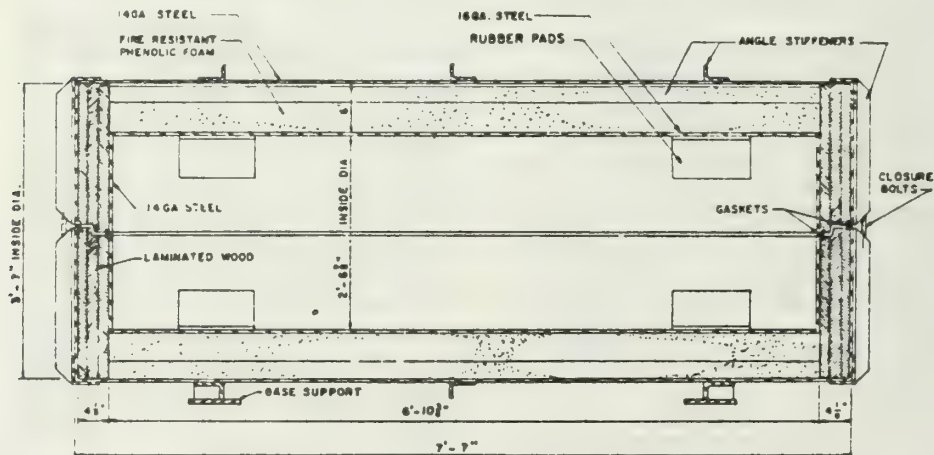
(1) "USA-DOT-21PF-1" or "2", as appropriate, and, if the inner shell is of stainless steel, additional marking such as "304L-SS" to indicate the type of stainless steel used.

(2) "TARE WT: xxx lbs. (or kg.)" where xxx is the tare weight of the assembled overpack without the inner container.

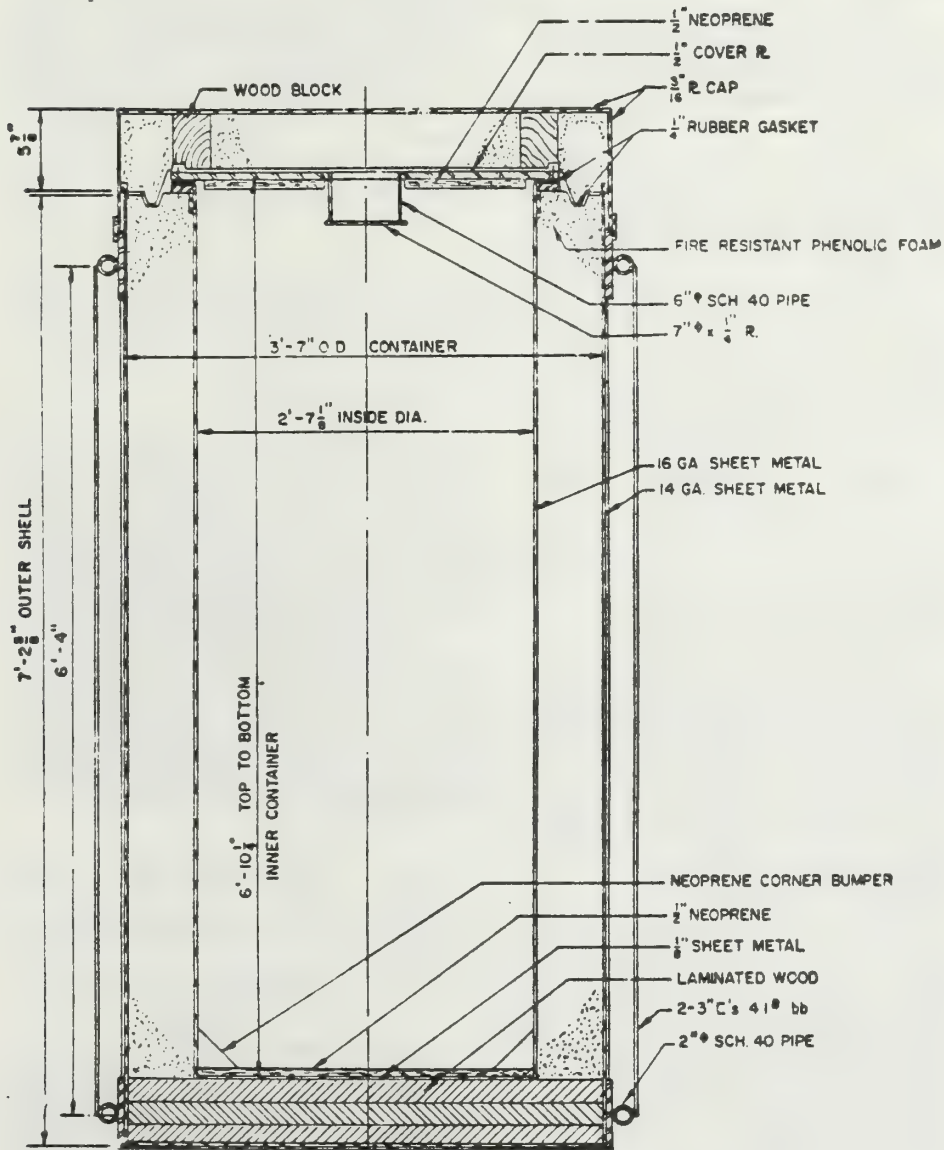
(3) Year of manufacture.

§ 178.121-4 Typical assembly detail.

(a) Specification 21PF-1 (horizontal loading overpack).



(b) Specification 21 PF-2 (end loading overpack).



§ 178.130 Specification 37K; steel drums.

Single trip container. Removable head containers which will pass all required tests are authorized.

§ 178.130-1 Compliance.

(a) Required in all details.

§ 178.130-2 Rated capacity.

(a) Rated capacity as marked, see § 178.130-8(a)(3). Actual capacity not less than rated (marked) capacity plus 2 percent, not greater than rated capacity plus 2 percent plus 1 quart.

§ 178.130-3 Composition.

(a) Sheets for body and heads to be low carbon, open hearth or electric steel.

§ 178.130-5 Parts and dimensions.

(a) Parts and dimensions as follows:

Marked capacity not over (gallons)	Authorized gross weight not over (pounds)	Type of container	Welded side seam required	Minimum thickness uncoated sheets (gauge)	
				Body sheet	Head sheet
55	275	Straight side	Yes...	22	22

(b) Steel sheets of specified gauges shall comply with the following:

Gauge No.	Nominal thickness ¹ (inch)	Minimum thickness (inch)
22.....	0.0299	0.0289

¹ Thickness shall be measured at any point on the sheet not less than $\frac{1}{4}$ inch from an edge.

§ 178.130-6 Closure required.

(a) Adequate to prevent leakage; to be of bolted ring or lever lock ring types only; sponge rubber gaskets required; flowed-in gaskets not permitted.

§ 178.130-7 Defective containers.

(a) Leaks and other defects to be repaired by method used in constructing container, not by soldering.

§ 178.130-8 Marking.

(a) Marking on each container by embossing on head, except that such embossment must be on the permanent head for drums having removable heads, with raised marks, or by embossing or die stamping on footring on drums equipped with footrings, or on metal plates securely attached to drum by brazing or welding not less than 20 percent of the perimeter, as follows:

(1) DOT-37K275.

(2) Name or symbol of person making the marks specified in paragraph (a) (1) of this section. Symbol, if used, must be registered with the Bureau of Explosives.

(3) Gauge of metal in thinnest part, rated capacity in gallons, and year of manufacture (for example, 18-55-50). When gauge of metal in body differs

from that in head, both must be indicated with slanting line between and with gauge of body indicated first (for example 14/12-55-50 for body 14 gauge and head 12 gauge).

(4) The letters STC; located near the DOT mark to indicate "single-trip container".

§ 178.130-9 Size of markings.

(a) Size of markings (minimum): $\frac{1}{2}$ " high for 30-gallon or less, $\frac{3}{4}$ " for over 30 gallons.

§ 178.130-10 Type test.

(a) Samples taken at random and closed as for use, shall withstand prescribed tests without leakage. Tests to be made of each type and size by each company starting production and to be repeated every 4 months. Samples last tested to be retained until further tests are made or for 1 year, whichever period is shorter. The type test is as follows:

(1) Test by dropping, filled with dry, finely powdered material to the authorized gross weight, from height of 4 feet onto solid concrete so as to strike diagonally on top chime. Closing devices and other parts projecting beyond chime or rolling hoops must also be capable of withstanding this test.

§ 178.131 Specification 37A; steel drums.

Single trip container. Removable head required.

§ 178.131-1 Compliance.

(a) Required in all details.

§ 178.131-2 Rated capacity.

(a) Rated capacity as marked, see § 178.131-9(a)(2). Minimum actual capacity of containers shall be not less than rated (marked) capacity plus 4 percent for containers not over 12 gallons capacity. Maximum actual capacity of containers not over 12 gallons capacity shall be not greater than rated (marked) capacity plus 5 percent or rated (marked) capacity plus 4 percent plus 1 quart whichever is the greater; for others, minimum actual capacity shall be not less than rated (marked) capacity plus

2 percent and maximum actual capacity shall not be greater than rated (marked) capacity plus 3 percent or rated (marked) capacity plus 2 percent plus 1 quart whichever is the greater.

§ 178.131-3 Composition.

(a) Sheets for body and heads to be hot-rolled or cold-rolled, low carbon, open-hearth or electric steel or standard commercial quality.

§ 178.131-5 Seams.

(a) Side seams must be welded; or locked and soldered when 28-gauge tin plate is used for containers of 2-gallon capacity or less.

§ 178.131-6 Capacities, weights, type, and gauges.

(a) Capacities, weights, type, and gauges must be as follows:

Marked capacity not over (gallons)	Authorized gross weight not over (pounds)	Type of container	Minimum thickness, uncoated sheets ¹ (gauge)		Minimum ring gauge bolted type ¹
			Body sheet ²	Head sheet	
2	40	Straight side	28	28	Lug.
5	60	do.	26	26	Lug or plain ring seal.
5	80	do.	24	24	
10	160	do.	24	24	18, plain.
55	150	do.	26	26	
55	275	do.	24	24	Do.
55	350	do.	24	24	16, 2 inch overlap.
55	480	do.	22	22	Do.

¹ All gauges specified are minimum except as provided by Part 173 of this chapter. Heavier (but not lighter) gauges may be specified if shipper so desires.

² Equally efficient closing devices may be authorized by the Bureau of Explosives upon demonstration of their ability to withstand tests prescribed in § 178.131-11.

³ Containers of 16 gallons capacity and over must have 2 swedged or corrugated rolling hoops of sufficient height to clear the closing device when the drum is rolled.

⁴ A gross weight of 490 pounds is authorized when defined by Part 173 of this chapter (see § 173.164(a)(2) of this chapter).

(b) Steel sheets of specified gauges shall comply with the following:

Gauge No.	Nominal thickness ¹ (inch)	Minimum thickness ¹ (inch)
22	0.0299	0.0269
24	.0239	.0209
26	.0179	.0159
28	.0149	.0129

¹ Thickness shall be measured at any point on the sheet not less than $\frac{3}{8}$ inch from an edge.

§ 178.131-7 Closures.

(a) Closures of the type specified in the above table adequate to prevent leakage; gaskets required, all closures to be of the full-removable head type. Curl at top of shell for all drums 30 gallons capacity and larger must have a minimum diameter of $\frac{7}{16}$ inch, and so made as to form a circular section with the under portion substantially in contact with the vertical shell. The removable head must have a minimum depth of $\frac{3}{4}$ inch and the cover bib must be large enough to extend to the horizontal center line of the top curl when the drum is sealed with the gasket in place. Drums of less than 30 gallons capacity may be

made with an outside curl diameter of $\frac{3}{8}$ inch minimum and a head depth of $\frac{3}{4}$ inch minimum; except that for drums less than 16 gallons capacity the outside curl diameter may be $\frac{9}{32}$ inch and the cover depth may be $\frac{3}{8}$ inch minimum.

(b) The closing ring must be so constructed that the bottom leg will extend well inside the vertical center line of the shell curl but must not touch the shell (recommended clearance is $\frac{1}{16}$ inch minimum, $\frac{3}{32}$ inch maximum) when sealed for usage. The top leg of the locking ring must have sufficient length to extend well inside the vertical center line of the curl on the shell. Closing rings must have a 2 inch overlap at joint when gross weight of drum exceeds 275 pounds. Overlap is not required for drums of 275 pounds or less gross weight. The clearance between ends of rings without overlap should be a minimum of $\frac{1}{8}$ inch and a maximum of $\frac{1}{2}$ inch.

(c) Closures or fittings in the removable head of any type capable of withstanding test prescribed by § 178.131-11 are authorized.

§ 178.131-8 Defective containers.

(a) Defective containers to be repaired by method used in constructing

container. Soldering not authorized, except for tin plated steel as authorized by § 178.131-5.

§ 178.131-9 Marking.

(a) Marking on each container by embossing on head, except that such embossment must be on the permanent head for drums having removable heads, with raised marks, or by embossing or die stamping on footring on drums equipped with footrings, or on metal plates securely attached to drum by brazing or welding not less than 20 percent of the perimeter, as follows:

(1) DOT-37A***. Stars to be replaced by the authorized gross weight, or less, at which the container was type tested (for example, DOT-37A150).

(2) Gauge of metal in thinnest part, rated capacity in gallons, and year of manufacture (for example, 24-55-54). When gauge of metal in body differs from that in either head, both must be indicated with slanting line between and with gauge of body indicated first (for example, 22/24-55-54 for a container having 22 gauge body, 22 gauge bottom head and 24 gauge top head).

(3) Name or symbol of person making the marks specified in paragraph (a)(1) of this section. Symbol, if used, must be registered with the Bureau of Explosives.

(4) The letters STC; located near the DOT mark to indicate "single-trip container".

§ 178.131-10 Size of markings.

(a) Size of markings, not less than 1/2 inch high for all containers.

§ 178.131-11 Type test.

(a) Samples, taken at random and closed as for use, shall withstand prescribed tests without leakage. Tests to be made of each type and size by each company starting production and to be repeated every 4 months. Samples last tested to be retained until further tests are made or for 1 year, whichever period is shorter. The type test is as follows:

(b) Test by dropping on top chime, or other part considered to be weaker, with drum filled to normal loading depth and to the gross weight at which container is marked with dry powdered material, and

topped with at least two inches of a finely divided, dry, free-flowing powder of the following sieve analysis:

% retained on 42 mesh = Trace (max.).
 % retained on 50 mesh = 3% (max.).
 % retained on 100 mesh = 88% (min.).

A material such as sodium bicarbonate is recommended. Container shall be dropped from a height of 4 feet onto solid concrete so as to strike diagonally on the chime and so positioned when equipped with bolted ring type closure that crush pattern will terminate at closure joint. Closing devices and other parts projecting beyond chime or rolling hoops must be capable of withstanding this test. No disc or material other than regular gaskets in closure part is permitted for test purposes.

§ 178.132 Specification 37B; steel drums.

Single trip container. Removable head not authorized.

§ 178.132-1 Compliance.

(a) Required in all details.

§ 178.132-2 Rated capacity.

(a) Rated capacity as marked, see § 178.132-9(a)(2). Minimum actual capacity of containers shall be not less than rated (marked) capacity plus 4 percent for containers not over 12 gallons capacity. Maximum actual capacity of containers not over 12 gallons capacity shall be not greater than rated (marked) capacity plus 5 percent or rated (marked) capacity plus 4 percent plus 1 quart whichever is the greater, for others, minimum actual capacity shall be not less than rated (marked) capacity plus 2 percent and maximum actual capacity shall not be greater than rated (marked) capacity plus 3 percent or rated (marked) capacity plus 2 percent plus 1 quart whichever is the greater.

§ 178.132-3 Composition.

(a) Sheets or body and heads to be hot-rolled or cold-rolled, low carbon, open hearth, or electric steel of standard commercial quality.

§ 178.132-5 Seams.

(a) Side seams may be welded, Gordon lock, or other equally efficient construction.

§ 178.132-6 Capacities, weights, type and gauges.

(a) Capacities, weights, type and gauges must be as follows:

Marked capacity not over (gallons)	Authorized gross weight not over (pounds)	Type of container	Minimum thickness, uncoated sheets (gauge)	
			Body sheet	Head sheet
5	60	Straight side	24	28
55	275	do.	26	26
55	450	do.	24	24
55	650	do.	22	22

¹ Containers of 16 gallons capacity and over must have small or series corrugations rolled into the shell or 2 swedged or corrugated rolling hoops.

² Twenty-four (24) gauge top head and cover authorized.

(b) Steel sheets of specified gauges shall comply with the following:

Gauge No.	Nominal thickness ¹ (inch)	Minimum thickness ¹ (inch)
22	0.0299	0.0269
24	.0239	.0209
26	.0179	.0159
28	.0149	.0129

¹ Thickness shall be measured at any point on the sheet not less than $\frac{1}{8}$ inch from an edge.

§ 178.132-7 Closures.

(a) Closures shall be of any type that will withstand prescribed drop tests without leakage, see § 178.132-11. Openings shall not exceed 9 inches in diameter in containers of 16-gallon capacity and larger nor 6 1/2 inches in diameter in containers less than 16-gallon capacity. Larger openings may be authorized upon demonstration and proof of satisfactory closure test. Gaskets required when necessary.

§ 178.132-8 Defective containers.

(a) To be repaired by method used in constructing container except that Gordon lock, or other similarly constructed seam must be welded. Soldering not authorized.

§ 178.132-9 Marking.

(a) Marking on each container by embossing on head with raised marks, or by embossing or die stamping on footring on drums equipped with footrings or on metal plates securely attached to drum by brazing or welding not less than 20 percent of the perimeter, as follows:

(1) DOT-37B * * * Stars to be replaced by the authorized gross weight, or less at which container was type tested (for example, DOT-37B450, etc.).

(2) Gauge of metal in thinnest part (except closure cover), rated capacity in gallons, and year of manufacture (for example, 24-55-54). When gauge of metal in body differs from that in either head, both must be indicated with slanting line between and with gauge of body indicated first (for example, 22/24-55-54 for a container having 22-gauge body, 22-gauge bottom head and 24-gauge top head).

(3) Name or symbol of person making the marks specified in paragraph (a) (1) of this section. Symbol, if used, must be registered with the Bureau of Explosives.

(4) The letters STC; located near the DOT mark to indicate "single-trip container".

§ 178.132-10 Size of markings.

(a) Size of markings (minimum), not less than $\frac{1}{2}$ inch high for all containers.

§ 178.132-11 Type test.

(a) Samples, taken at random and closed as for use, shall withstand prescribed tests without leakage. Tests to be made of each type and size by each company starting production and to be repeated every 4 months. Samples last tested to be retained until further tests are made or for 1 year, whichever period is shorter. The type test is as follows:

(b) Test by dropping on top chime, filled with dry finely powdered material to the gross weight at which container is marked, from a height of 4 feet onto solid concrete so as to strike diagonally on the chime and so positioned as to strike, in the case of offset openings, at the point on the chime nearest the opening. Closing devices and other parts projecting beyond chimes must also be capable of withstanding this test.

§ 178.133 Specification 37P; steel drums with polyethylene liner.

Nonreusable containers.

§ 178.133-1 Compliance.

(a) Required in all details.

§ 178.133-2 Rated capacity of assembled composite containers.

(a) Rated capacity as marked, see § 178.133-9. Minimum actual capacity of containers shall be not less than rated (marked) capacity, plus 4 percent. Maximum actual capacity shall not be greater than rated (marked) capacity plus 5 percent or rated (marked) capacity plus 4 percent plus 1 quart whichever is the greater.

§ 178.133-3 Steel composition.

(a) Sheets for body and heads to be low carbon, open hearth or electric steel.

§ 178.133-4 Seams.

(a) Side seams welded.
(b) Chime of permanent head, double seamed.

§ 178.133-5 Parts and dimensions for steel drums.

(a) Parts and dimensions for steel drums shall be as follows:

Drums for plastic liner of rated capacity not over (gallons)	Type of container ^{1 2}	Body sheet (gauge)	Bottom head sheet (gauge)	Removable head sheet (gauge)	Type of removable head closure
5.....	Straight side, single bead.....	26	26	24	Ring seal, bolted ring, lug cover.
6 1/2.....	Straight side, single bead.....	24	24	24	Ring seal, bolted ring, lug cover.
15.....	Straight side ³	22	22	19	Ring seal, bolted ring, lug cover.

¹ Drum interior shall be free of projections, burrs, or any edges that will cause damage to liners, and shall be free of lubricants, oil or other foreign matter. Drum shall provide a snug fit for the plastic liner.

² One hole not over 3/16 inch in diameter permitted in body or a head, or two 1/8 inch holes in bottom head near the chime.

³ For containers up to 10 gallons capacity, a single rolled or swedged bead in body near top curl required; for containers of 10 gallons and greater capacity, 2 rolled or swedged rolling hoops in drum body required.

⁴ Twenty (20) gauge authorized.

(b) Steel sheets of specified gauges shall comply with the following:

Gauge No.	Nominal thickness ¹ (inch)	Minimum thickness ¹ (inch)
19.....	0.0418	0.0378
20.....	.0359	.0324
22.....	.0299	.0259
24.....	.0239	.0209
26.....	.0179	.0159

¹ Thickness shall be measured at any point on the sheet not less than 3/4 inch from edge.

§ 178.133-6 Liner.

(a) Each metal drum shall contain a contour fitting polyethylene liner having heat-sealed seams or a one-piece seamless molded polyethylene unit, attached to the pour opening in the removable head so as to provide a container that is completely resistant to lading when closed as for use.

(b) Polyethylene liner or molded unit shall be fabricated throughout of virgin polyethylene tubing or mold material, which may include a low percentage of elastomeric polymer having minimum thickness of 0.010 inch and having the following physical properties:

(1) Resin should have a maximum melt index value of 1.8 plus 0.4 per 10

minutes, and shall have a minimum average molecular weight of 21,000.

§ 178.133-7 Closure.

(a) Closure shall be resistant to lading and adequate to prevent leakage. Openings in removable head shall not be over 2.85 inches in diameter. Venting closures are permitted when required by Part 173 of this chapter.

§ 178.133-8 Defective containers.

(a) Repaired polyethylene liners are not authorized.

§ 178.133-9 Marking.

(a) Marking on the permanent head of each container by embossing with raised marks as follows:

(1) DOT-37P. The letters NRC located just above or below the DOT mark to indicate a nonreusable container.

(2) Name or symbol of person making the marks specified in paragraph (a) (1) of this section. Symbol, if used, must be registered with the Bureau of Explosives.

(3) Gauge of metal in thinnest part, rated capacity of assembled composite container in gallons, and year of manufacture (for example, 24-5-57). When gauge of metal in body differs from that

in head, both must be indicated with slanting line between and with gauge of body indicated first (for example, 26 24-557 for body 26-gauge and head 24-gauge).

§ 178.133-10 Size of markings.

(a) Size of markings (minimum) $\frac{1}{2}$ inch high.

§ 178.133-11 Type tests.

(a) Three samples of each size container manufactured taken at random, filled with water to 98 percent of actual capacity and closed as for use, shall withstand drop tests from height of 4 feet onto solid concrete as prescribed by subparagraphs (1), (2) and (3) of this paragraph, without leakage or potentially hazardous rupture of outside container. Tests shall be made at start of production and repeated at 4-month intervals thereafter. Samples last tested to be retained until further tests are made or for 1 year, whichever period is shorter. No single container shall be expected to withstand more than one of the following:

- (1) Diagonal drop on top chime.
- (2) Diagonal drop on bottom chime.
- (3) Flat drop on side of drum.

(b) Completely assembled composite containers of each size manufactured, filled to 98 percent of actual capacity with water, shall be capable of withstanding a vibration test by placing the container on the vibration table anchored in such manner that all horizontal motion shall be restricted and only vertical motion allowed. The test shall be performed for one hour using an amplitude of one inch at a frequency that causes the test container to be raised from the floor of the table to such a degree that a piece of paper or flat steel strap or tape can be passed between the table and the container.

§ 178.133-12 Test.

(a) Each assembled container shall be tested by retaining at least $1\frac{1}{2}$ pounds per square inch air pressure at equilibrium without showing pressure drop on a suitable gauge.

§ 178.134 Specification 37M; cylindrical steel overpack, straight sided for inside plastic container; nonreusable containers.

§ 178.134-1 Material requirements.

(a) Sheets for body and heads to be low carbon, open hearth or electric steel.

§ 178.134-2 Construction requirements.

(a) Construction requirements are as follows:

Rated capacity of inside plastic container not over (gallons)	Minimum thickness, uncoated sheets (gauge)		Body seams	Rolling hoops	Top or bottom head	Closures when full removable head is used (gaskets not required)
	Body sheet	Head sheet				
5.....	26	26	Welded.....	None required....	Double seamed.	Lug or plug ring seal
15.....	24	24	do.....	Rolled or swedged.	do.....	do
30.....	24	24	do.....	do.....	do.....	Bolted type ring closure, 18 gauge.
55.....	24	24	do.....	do.....	do.....	Bolted type ring closure, 16 gauge.

(b) Steel sheets or parts of specified gauges shall comply with the following:

Gauge No.	Nominal thickness (inch) ¹	Minimum thickness (inch) ¹
16.....	0.0598	0.0533
18.....	.0475	.0428
24.....	.0239	.0209
26.....	.0179	.0159

¹ Thickness shall be measured at any point on the sheet not less than $\frac{3}{4}$ inch from an edge.

(c) Two holes not exceeding $\frac{1}{4}$ inch each are permitted diametrically opposite each other in the overpack body immediately above the double seam of the bottom chime and three holes not exceeding $\frac{3}{16}$ inch in diameter on centers 120 degrees apart in the bottom head.

(1) Overpack interior shall be free of projections, burrs, or any edges that might cause damage to inside plastic container and shall be free of lubricants, oils, or any foreign matter.

(2) Top head may have not more than two holes of suitable size to provide for protruding closures.

(3) Overpack shall be constructed to provide snug fit for inside plastic container.

§ 178.134-3 Tests.

(a) Steel overpack when assembled as for use, shall withstand the tests prescribed, in specifications for inside plastic containers as detailed in Part 178 when authorized as combination packages in Part 173 of this chapter. The completed package must withstand these tests without producing a condition of the overpack that could result in potential damage to the inside container.

§ 178.134-4 Marking.

(a) Marking on each container by embossing on bottom head with raised marks with letter and figures not less than $\frac{1}{2}$ inch high as follows:

(1) DOT-37M. The letters NRC located near the DOT mark to indicate "Non-reusable container."

(2) Name or symbol of person making the marks specified in paragraph (a) (1) of this section. Symbol, if used, must be registered with the Bureau of Explosives.

(3) Gauges of metal in thinnest part, rated capacity of the inside container in gallons, and year of manufacture (for example, 24-55-62). When gauge of metal in body differs from that in either head, both must be indicated with slanting line between and with gauge of body indicated first (for example, 24/22-55-62 for a container having 24-gauge body and 22-gauge top head).

§ 178.135 Specification 37C; steel drums.

Nonreusable container. Removable head required.

§ 178.135-1 Compliance.

(a) Required in all details.

§ 178.135-2 Rated capacity.

(a) Rated capacity as marked (see § 178.135-8). Maximum actual capacity of containers shall be not greater than rated (marked) capacity plus 5 percent or rated (marked) capacity plus 4 percent plus 1 quart whichever is the greater.

§ 178.135-3 Composition.

(a) Sheets for body and heads to be hot-rolled or cold-rolled, low carbon, open-hearth or electric steel of standard commercial quality.

§ 178.135-4 Seams.

(a) Side seams must be welded.

§ 178.135-5 Capacities, weights, type and gauges.

(a) Capacities, weights, type and gauges must be as follows:

Marked capacity not over (gallon)	Authorized gross weight not over (pounds)	Type of container	Minimum thickness, uncoated sheets (gauge)		
			Body sheet	Bottom head sheet ¹	Removable head sheet ^{2,3}
5.....	80.....	Straight side.	28	28	26

¹ Bottom head must have three inwardly-embossed circumferential beads.

² Removable head must have two inwardly-embossed circumferential beads.

³ Removable head must have not less than 16 lugs spaced not more than $\frac{1}{4}$ inch apart.

(b) Steel sheets of specified gauges shall comply with the following:

Gauge No.	Nominal thickness ¹ (inch)	Minimum thickness ¹ (inch)
26.....	0.0179	0.0159
28.....	0.0149	0.0129

¹ Thickness shall be measured at any point on the sheet not less than $\frac{3}{4}$ inch from an edge.

§ 178.135-6 Closures.

(a) Closures shall be capable of withstanding test prescribed by § 178.135-10. Removable head may be equipped with leakproof fittings for filling.

§ 178.135-7 Defective containers.

(a) Defective containers to be repaired by method used in constructing container.

§ 178.135-8 Marking.

(a) Marking on each container by embossing on the permanent head as follows:

(1) DOT-37C**. Stars to be replaced by the authorized gross weight, or less, at which container was type tested (for example, DOT-37C80).

(2) Gauge of metal in thinnest part rated capacity, and year of manufacture

(for example, 26-5-64). When gauge of metal in body differs from that in either head, both must be indicated with slanting line between and with gauge of body indicated first (for example, 28/26-5-64) for a container having 28-gauge body, 28-gauge bottom head, and 26-gauge removable head.

(3) Name or symbol of person making the marks specified in paragraph (a)(1) of this section. Symbol, if used, must be registered with the Bureau of Explosives.

(4) The letters NRC; located near the DOT mark to indicate "nonresuable container."

§ 178.135-9 Size of markings.

(a) Size of markings, not less than $\frac{1}{2}$ inch for all containers.

§ 178.135-10 Type test.

(a) Samples, taken at random and closed as for use, shall withstand prescribed test without leakage. Tests to be made of each type and size by each company starting production and to be repeated every four months. Samples last tested to be retained until further tests are made. The type test is as follows:

(b) Test by dropping on top chime, or other part considered to be weaker, with drum filled to normal loading depth and to the gross weight at which container is marked with dry powdered material, and topped with at least two inches of a finely divided, dry, free-flowing powder of the following sieve analysis:

Percent retained on 42 mesh—Trace (maximum).

Percent retained on 50 mesh—3 percent (maximum).

Percent retained on 100 mesh—88 percent (minimum).

(c) A material such as sodium bicarbonate is recommended. Container shall be dropped from a height of 4 feet onto solid concrete so as to strike diagonally on the chime. Closing devices and other parts projecting beyond chime or rolling hoops must be capable of withstanding this test. No disc or material other than regular gaskets in closure part is permitted for test purposes.

§ 178.136 Specification 42E; aluminum drums.

Single-trip container.

§ 178.136-1 Compliance.

(a) Required in all details.

§ 178.136-2 Rated capacity.

(a) Rated capacity as marked, see § 178.136-9(a)(3), 55 gallons; actual capacity shall be rated capacity plus at least 2 percent.

§ 178.136-3 Composition.

(a) Body and heads of aluminum alloy 5052. Plastic closure plugs authorized if suitably resistant to action of lading.

§ 178.136-4 Outage.

(a) Two percent of rated capacity, plus a maximum tolerance of 1 quart.

§ 178.136-5 Seams.

(a) Welded, including attachment of flanges for closures and other devices. Circumferential seams at last 3" from top of chime; chime seams not permitted.

§ 178.136-6 Parts and dimensions.

(a) To be a minimum of 0.064 inch thick.

(b) Rolled or swedged in rolling hoops required.

§ 178.136-7 Closures.

(a) Of screw-thread type or secured by screw-thread device; openings over 2.3 inches not authorized; suitable gaskets required; head openings only permitted. Vented closing devices of type approved by the Bureau of Explosives are authorized when specified by the purchaser.

(b) Threaded plugs, or caps, and flanges must be close fitting with gasket surfaces which bear squarely on each other when without gasket; they must have not over 12 threads per inch, with at least 3 threads engaged when gasket is in place; two $\frac{5}{16}$ -inch drainage holes are authorized in flange.

§ 178.136-8 Head rings.

(a) Must be of 14 Brown and Sharpe gauge (0.064") tack-welded to each head.

§ 178.136-9 Marking.

(a) Marking on each container on top head, by stamping with pressure dies, by embossing with raised marks, or plate attached by welding, as follows:

(1) DOT-42E. The letters STC; located just below or above the DOT mark to indicate "single-trip container".

(2) Name or symbol of person making the mark specified in paragraph (a)(1) of this section and located just above, below, or following that mark. Symbol, if used, must be registered with the Bureau of Explosives.

(3) Gauge of metal, Brown and Sharpe, at start of fabrication; rated capacity in gallons; year of manufacture (for example, 7-30-50).

§ 178.136-10 Size of marking.

(a) Size of marking (minimum): 1 inch high.

§ 178.136-11 Type tests.

(a) Samples, taken at random and closed as for use, shall withstand prescribed tests without leakage. Tests to be made of each type and size by each company starting production and to be repeated every 4 months. Samples last tested to be retained until further tests are made or for 1 year, whichever period is shorter. The type tests are as follows:

(1) Test by dropping, filled with water to 98 percent capacity, from height of 6 feet onto solid concrete so as to strike diagonally on chime, or when without chime seam, to strike on other circumferential seam; also additional test on any other parts which might be considered weaker than the chime.

(2) Hydrostatic pressure test of 60 pounds per square inch sustained for 5 minutes.

§ 178.136-12 Leakage test.

(a) Each container shall be tested, with seams under water or covered with soapsuds or heavy oil, by interior air pressure of at least 10 pounds per square inch. Leakers shall be rejected or repaired and retested.

§ 178.136-13 Defective containers.

(a) Leaks and other defects shall be repaired by welding, using welding material of the same composition as originally used by the manufacturer of the drum or other approved aluminum base alloy of equal corrosion and strength qualities.

§ 178.137 Specification 37D; steel drum. Nonreusable container. Open-head not authorized.

§ 178.137-1 General requirements.

Each drum must meet the applicable requirements of § 173.24 of this chapter.

§ 178.137-2 Rated capacity.

(a) Rated capacity is 55 gallons, as marked (see § 178.137-6).

(b) Actual capacity must be the rated capacity plus 4-5 percent.

§ 178.137-3 General construction requirements.

(a) *Chime reinforcement.* The top and bottom chimes must be reinforced with a steel band that is an integral part of the double seam and which provides a chime cross section containing at least eight layers of steel. The reinforcing band must follow and support the knuckle radius of the head with the inside edge upturned so that the edge does not contact the adjacent portions of the head.

(b) *Seams.* The body side seam must be welded.

(c) *Sidewall construction.* A continuous series of parallel, geometrically similar circumferential beads must be expanded in the drum sidewalls so that the surface length of the steel in the axial direction does not change more than 1 percent during forming.

(d) *Steel thickness.* (1) The thickness of the body and heads of the finished drum must be at least 23-gage.

(2) The chime reinforcement must be made of at least 18-gauge steel.

(e) *Heads.* Heads must be flat. Open-head drums are not authorized.

§ 178.137-4 Closure.

(a) The closing part (plug, cap, plate, etc.) must be of steel at least 23-gage thickness, or other material of equivalent strength. Gaskets are required. Cap seals may be placed over the closure.

(b) For closures with threaded plug or cap, the seat (e.g., flange) for the plug or cap must have three or more threads. Two drainage holes of not over $\frac{3}{16}$ -inch diameter are authorized. The plug or cap must have a sufficient length of thread to engage at least three threads when securely tightened with the gasket in place.

(c) The maximum permitted closure opening is 2.7 inches in diameter.

§ 178.137-5 Defective drums.

Defects or damage must be repaired by the method used in constructing the drum. Soldering is not authorized.

§ 178.137-6 Marking.

(a) Marking must be as prescribed in § 173.24 of this chapter.

(b) The marking on each drum must be by embossing on the bottom head with raised marks as follows: "DOT-37D NRC"; and the gage of the metal of the drum in the thinnest part, the rated capacity of the drum in gallons, and the year of manufacture (e.g., 23-55-70). When the gage of the metal in the drum wall differs from that in the head, both must be indicated with a slanting line between, and with the gage of the wall indicated first (e.g., 23/22-55-70).

(c) The minimum height of the letters and numerals shall be three-fourths inch.

(d) The depth of embossing must be at least 0.015 inch and not more than 0.025 inch, but in no case may the depth exceed the thickness of the metal sheet being embossed. The dies used to form the embossing marks must be free of sharp edges or corners that might cause a stress riser in the mark. The embossing marks must be at least 4 inches from the outside edge of the chime.

§ 178.137-7 Tests.

(a) Each drum must be capable of withstanding the prescribed tests without leakage of contents.

(b) Samples which are taken at random and closed as for use must be tested as prescribed in subparagraphs (1) and (2) of this paragraph without leakage.

Tests are to be made of each type and size by each manufacturer starting production and are to be repeated at least every 4 months thereafter. The samples last tested must be retained by the manufacturer until further tests are made or for 1 year, whichever period is shorter.

(1) *Drop test.* Test by dropping, filled with water to 98 percent capacity, from a height of 4 feet onto a solid unyielding surface (e.g., concrete or steel) so as to strike the surface diagonally on the chime. Additional similar drops must be made on any other parts of the drum which might be considered weaker than the chime. Closing devices and other parts projecting beyond the chime or sidewall beads must also be capable of withstanding this test.

(2) *Pressure test.* Hydrostatic pressure test of at least 15 pounds per square inch, sustained without pressure drop for at least 5 minutes.

(c) *Leakage test.* Each drum must be tested for leakage with seams under water, or covered with soapsuds or heavy oil, or equivalent material. Interior air pressure of at least 7 pounds per square inch must be applied, and the seams and chimes examined for evidence of leakage. Leaking drums must be rejected, or repaired (see § 178.137-5) and retested.

§ 178.140 Specification 13; metal kegs.

§ 178.140-1 Compliance.

(a) Required in all details.

§ 178.140-2 Composition.

(a) To be open-hearth or electric steel, box annealed dead soft; carbon not over 0.14 percent.

§ 178.140-3 Parts and dimensions.

(a) Parts and dimensions as follows:

	Gross weight of kegs and contents			
	Not over 15 pounds	Not over 30 pounds ¹	Over 30 pounds but not over 75 pounds	Over 75 pounds but not over 150 pounds
Thickness of material:				
Body.....	30 gauge.....	28 gauge.....	24 gauge.....	24 gauge.....
Head.....	do.....	do.....	28 gauge.....	28 gauge.....
Number of lap for side seam ²	$\frac{3}{16}$ inch.....	$\frac{7}{16}$ inch.....	$\frac{3}{16}$ inch.....	$\frac{1}{2}$ inch.....
Number of corrugations in each end of body.....	3.....	5.....	5.....	7.....
Minimum depths of corrugations.....	$\frac{3}{16}$ inch.....	$\frac{3}{32}$ inch.....	$\frac{3}{32}$ inch.....	$\frac{3}{32}$ inch.....
Width of laps on body and head seams ²	$\frac{3}{16}$ inch.....	$\frac{3}{16}$ inch.....	$\frac{3}{16}$ inch.....	$\frac{3}{16}$ inch.....
Width of laps on head for head seams ²	$\frac{3}{16}$ inch.....	$\frac{3}{8}$ inch.....	$\frac{3}{8}$ inch.....	$\frac{3}{4}$ inch.....
Head seams.....	Double lap.....	Double lap.....	Double lap.....	Single lap.....

¹ Smokeless powder 32 pounds gross.

² Dimension requirements do not apply for kegs manufactured with double-seamed, compound-lined chime seams and lapped and soldered side seams.

NOTE: Dimensions of materials specified are minimum requirements. Gauge specified is for commercial plate, United States standard. Corrugations not required in body of kegs for gross weights not over 7 pounds.

§ 178.140-4 Seams.

(a) For gross weight over 75 pounds, all seams welded, brazed, soldered, or riveted, rivets at not over 5" centers.

§ 178.140-5 Closures.

(a) *Slide type.* Metal holder, for slide, securely fastened to head; washer of suitable material 0.025" thick; metal drop with depression to fit into bunghole and hold washer in place; metal slide to cover the foregoing. Positive fastening required between slide and slide holder to prevent leakage in transit; friction fastening not authorized.

(b) *Cap or plug type.* Metal holder, for cap or plug, securely fastened to head; metal cap or plug, with gasket when necessary to prevent sifting. Positive fastening required between cap, or plug, and holder to prevent leakage in transit; friction fastening not authorized.

§ 178.140-6 Marking.

(a) Marking on each container by embossing on head with raised marks as follows:

(1) DOT-13.

(2) Name or symbol of person making the mark specified in paragraph (a) (1) of this section. Symbol, if used, must be registered with the Bureau of Explosives.

§ 178.140-7 Size of markings.

(a) Size of markings (minimum): $\frac{5}{16}$ " high.

§ 178.140-8 Type test.

(a) Keg filled with fine, dry sand in weight equal to that of shipment must be capable of withstanding, without leakage, four successive drops of 4 feet on the head onto solid concrete. Tests to be made of each type and size by each company manufacturing this type of container and to be repeated every 6 months while in production. If production is discontinued and is resumed, this requirement will also apply if prescribed tests have not been made within the previous 6-month period. Samples last tested to be retained until further tests are made or for 1 year, whichever period is shorter.

§ 178.140-9 Filling with contents.

(a) *Lining.* Cloth bag lining required for gross weight over 32 pounds; neck of bag to be securely tied.

§ 178.140-10 Additional keg.

(a) *Stove-pipe keg.* Authorized only for shipments loaded by shipper and to be unloaded by consignee and for gross weight of 30 pounds. Must comply with all requirements, except § 178.140-5, and also with the following:

(1) Length to be about 4 times diameter; cap (slip cover) to have snug fit over body with 3" overlap.

(2) Contents to be enclosed in double paper tubes, with pasted seams, not over 2 $\frac{1}{2}$ " diameter and made of tough manila paper weighing at least 50 pounds per 480 sheets 24" x 36"; outside tube to be waxed. Ends of tubes to be folded and tucked between folds of tube to prevent leakage.

NOTE 1: Because of the present emergency and until further order of the Department, a ream may consist of 500 sheets.

§ 178.141 Specification 13A; metal drums.

§ 178.141-1 Compliance.

(a) Required in all details.

§ 178.141-2 Type.

(a) Straight sided; authorized only for material cast solid and with filling end head applied after material is loaded and closed in the manner prescribed in § 178.141-6. No other openings permitted.

§ 178.141-3 Composition.

(a) To be low carbon, open-hearth or electric steel.

§ 178.141-4 Heads and body.

(a) *Heads.* To be not less than 28 gauge United States standard.

(b) *Body.* To be not less than 28 gauge United States standard.

§ 178.141-5 Seams.

(a) Must be welded.

§ 178.141-6 Heads.

(a) To be attached by means of double lapped-seam.

§ 178.141-7 Marking.

(a) Marking on each container by embossing on head with raised marks as follows:

(1) DOT-13A.

(2) Name or symbol of person making the mark specified in paragraph (a) (1) of this section. Symbol, if used, must be registered with the Bureau of Explosives.

(3) Size of markings (minimum): 5/16 inch high.

§ 178.141-8 Type tests.

(a) Drum filled and closed as for shipment must be capable of withstanding, without rupture, 4 successive drops of 4 feet on the head onto solid concrete.

(b) Drum must be capable of withstanding hydrostatic pressure test of 30 pounds per square inch, sustained for 5 minutes.

(c) Tests to be made of each type and size by each company manufacturing this type of container and to be repeated every 6 months while in production. If production is discontinued and is resumed, this requirement will also apply if prescribed tests have not been made within the previous 6-month period. Samples last tested to be retained until further tests are made or for 1 year, whichever period is shorter.

§ 178.146 Specification 32A; metal cases, riveted or lock-seamed.

§ 178.146-1 Compliance.

(a) Required in all details.

§ 178.146-2 Gauge standards.

(a) United States standards for sheet metal; American or Brown and Sharpe for wire.

§ 178.146-3 Covers.

(a) To have at least 1" lap on body and to fit with clearance not over 1/32"; lapped corners to be welded.

§ 178.146-4 Edge protection.

(a) Open edges of body must be turned or rolled inward; front open edge of cover must be turned or rolled outward. Not required for material at least 20-gauge thick or for "trailer" cases.

§ 178.146-5 Bottom protection.

(a) Face on which case will ordinarily rest must be reinforced with continuous angle straps, or be fitted with trunk corners, or be double thickness along edges. Not required for cases of at least 20-gauge metal or of not over 1 reel capacity or for "trailer" cases.

§ 178.146-6 Hinges.

(a) To be of continuous loop type with loops of steel wire at least 7-gauge,

welded; hinge straps at least 18-gauge securely welded or riveted.

§ 178.146-7 Carrying handles.

(a) Any type of adequate strength.

§ 178.146-8 Closing devices.

(a) To be of sufficient strength and efficiency to prevent injury or unfastening in tests (§ 178.146-14) or in transit.

§ 178.146-9 Rivets.

(a) At least 5/32" diameter; length to furnish efficient heads; split rivets not authorized except for attachment of lining.

§ 178.146-10 Rivet reinforcement.

(a) Hinges, fastening devices, and handles, when riveted in place, must have additional inside reinforcement of steel, at least as thick as in case, through which rivets must pass. Not required when case is made of at least 20-gauge material throughout.

§ 178.146-11 Lining.

(a) Required throughout; to be hard-surfaced fiberboard at least 0.125" thick and with strength of 800 pounds, Mullen or Cady test, or wooden lining at least 0.25" thick.

§ 178.146-12 Metal partitions.

(a) Metal partitions (when used) to be as thick as body of case, permanently fastened to the case, and lined the same as the case.

§ 178.146-13 Protective coating.

(a) Steel cases must be of galvanized material or protected from corrosion by paint, lacquer, or other adequate coating.

§ 178.146-14 Type tests.

(a) Cases completely filled as for shipment must be capable of withstanding 4 successive drops onto solid concrete from a height of 6 feet without rupture of case or permanent damage to or unfastening of closing device. Tests to be made by dropping on cover, seam, or any corner.

§ 178.146-15 Marking.

(a) Marking on each container by the maker with plain and permanent marks at least 1/2" high as follows:

(1) DOT-32A.

(2) Name or symbol of person making the mark specified in paragraph (a)(1) of this section and located just above, below, or following that mark.

Symbol, if used, must be registered with the Bureau of Explosives.

§ 178.146-16 Cases with capacity (approx.) not over 9,000 feet of 1 $\frac{3}{8}$ " film.

(a) Compliance with §§ 178.146-1 to 178.146-15 required. Seams to be lock-seams or riveted. Material to be steel, at least 20 gauge, 2 hinges, 1 fastening device, and 1 carrying handle required.

§ 178.146-17 Cases with capacity (approx.) not over 8,000 feet of 1 $\frac{3}{8}$ " film or 4,500 feet of 2 $\frac{1}{2}$ " film.

(a) Construction as in § 178.146-16, except: 22-gauge material authorized; 1 hinge authorized for single-reel cases.

§ 178.146-18 Cases with capacity not over 1 reel of 10" diameter.

(a) Construction as in § 178.146-16, except: 24-gauge material and 1 hinge authorized.

§ 178.146-19 Cases with capacity not over 500 feet of film, "Trailer Cases".

(a) Construction as in § 178.146-16, except: 26-gauge material and 1 hinge of any type authorized.

§ 178.147 Specification 32B; metal cases, welded or riveted.

§ 178.147-1 Compliance.

(a) Required in all details.

§ 178.147-2 Gauge standards.

(a) United States standard for sheet metal; American or Brown and Sharpe for wire.

§ 178.147-3 Covers.

(a) To have at least 1" lap on body and to fit with clearance not over $\frac{1}{32}$ "; lapped corners to be welded.

§ 178.147-4 Edge protection.

(a) Open edges of body must be turned or rolled inward; front open edge of cover must be turned or rolled outward. Not required for material at least 20-gauge thick or for "trailer" cases.

§ 178.147-5 Bottom protection.

(a) Face on which case will ordinarily rest must be reinforced with continuous angle straps, or be fitted with trunk cor-

ners, to be double thickness along edges. Not required for cases of at least 20-gauge metal or of not over 1 reel capacity or for "trailer" cases.

§ 178.147-6 Hinges.

(a) To be of continuous loop type with loops of steel wire at least 7-gauge, welded; hinge straps at least 18-gauge securely welded or riveted.

§ 178.147-7 Carrying handles.

(a) Any type of adequate strength.

§ 178.147-8 Closing devices.

(a) To be of sufficient strength and efficiency to prevent injury or unfastening in tests (§ 178.147-14) or in transit.

§ 178.147-9 Rivets.

(a) At least $\frac{5}{32}$ " diameter; length to furnish efficient heads; split rivets not authorized except for attachment of lining.

§ 178.147-10 Rivet reinforcement.

(a) Hinges, fastening devices, and handles, when riveted in place, must have additional inside reinforcement of steel, at least as thick as in case, through which rivets must pass. Not required when case is made of at least 20-gauge material throughout.

§ 178.147-11 Lining.

(a) Required throughout; to be hard-surfaced fiberboard at least 0.125" thick and with strength of 800 pounds, Mullen or Cady test, or wooden lining at least 0.25" thick.

§ 178.147-12 Metal partitions.

(a) Metal partitions (when used) to be as thick as body of case, permanently fastened to the case, and lined the same as the case.

§ 178.147-13 Protective coating.

(a) Steel cases must be of galvanized material or protected from corrosion by paint, lacquer, or other adequate coating.

§ 178.147-14 Type tests.

(a) Cases completely filled as for shipment must be capable of withstanding 4 successive drops onto solid concrete from a height of 6 feet without rupture of case or permanent damage to or unfastening of closing device. Tests to be made by dropping on cover, seam, or any corner.

§ 178.147-15 Marking.

(a) Marking on each container by the maker with plain and permanent marks at least $\frac{1}{2}$ " high as follows:

(1) DOT-32B.

(2) Name or symbol of person making the mark specified in paragraph (a) (1) of this section and located just above, below, or following that mark. Symbol, if used, must be registered with the Bureau of Explosives.

§ 178.147-16 Cases with capacity (approximate) not over 12,000 feet of $1\frac{3}{8}$ " film or 6,000 feet of $2\frac{1}{2}$ " film.

(a) Compliance with §§ 178.147-1 to 178.147-15 required. Seams to be welded or riveted. Material to be steel, or aluminum-manganese alloy, at least 18-gauge, 2 hinges, 2 fastening devices spaced as for hinges, and 2 carrying handles required.

§ 178.147-17 Cases with capacity (approximate) not over 9,000 feet of $1\frac{3}{8}$ " film.

(a) Compliance with §§ 178.147-1 to 178.147-16, except: 1 fastening device and 1 carrying handle authorized.

§ 178.147-18 Cases with capacity (approximate) not over 8,000 feet of $1\frac{3}{8}$ " film or 4,500 feet of $2\frac{1}{2}$ " film.

(a) Construction as in § 178.147-16, except: 20-gauge material, 1 fastening device, and 1 carrying handle authorized; 1 hinge authorized for single-reel cases. Detachable covers (no hinges) with $\frac{3}{4}$ " lap on body and efficiency to prevent displacement in tests, are authorized. Trailer cases, capacity not over 500 feet of film, no handle required. Cover lap not less than full one-half inch.

§ 178.148 Specification 32C; metal trunks.

§ 178.148-1 Design.

(a) To be designed to contain film in film-reel cans and projecting apparatus only; other articles not authorized therein.

§ 178.148-2 Strength.

(a) To be of strength and efficiency to carry contents in ordinary handling without damage to trunk or contents.

§ 178.148-3 Compartments.

(a) Separate compartments required for each reel of film and for projecting apparatus; each compartment to be constructed so that, in closing, it will have no cracks or openings.

§ 178.148-4 Compartment linings.

(a) Each film compartment to be made of, or lined throughout with, sheet metal; this metal to be protected against contact with film-reel can by a substantial interlining of fiberboard or equivalent.

§ 178.148-5 Marking.

(a) Marking on each container by the maker with plain and permanent marks at least $\frac{1}{2}$ " high applied on 2" by 4" metal plate securely riveted to top of cover of trunk as follows:

(1) DOT-32C.

(2) Name or symbol of person making the mark specified in paragraph (a) (1) of this section and located just above, below, or following that mark. Symbol, if used, must be registered with the Bureau of Explosives.

§ 178.149 Specification 32D; metal boxes for old and worn-out motion-picture film no longer exhibitable.

§ 178.149-1 Compliance.

(a) Required in all details.

§ 178.149-2 Gauge standards.

(a) United States standard for sheet metal; American or Brown and Sharpe for wire.

§ 178.149-3 Material.

(a) Material to be steel; body and bottom at least 16-gauge; cover at least 18-gauge.

§ 178.149-4 Joints and seams.

(a) All joints and seams to be welded or riveted.

§ 178.149-5 Cover.

(a) Cover must be tight-fitting, to prevent entrance of sparks, with provision for secure fastening to be locked or sealed.

§ 178.149-6 Type tests.

(a) Cases completely filled as for shipment must be capable of withstanding 4

successive drops onto solid concrete from a height of 4 feet without rupture of case or permanent damage to or unfastening of closing device. Tests to be made by dropping on cover, seam, or any corner.

§ 178.149-7 Marking.

(a) Marking on each container by the maker with plain and permanent marks at least $\frac{1}{2}$ " high as follows:

(1) DOT-32D.

(2) Name or symbol of person making the mark specified in paragraph (a)(1) of this section and located just above, below, or following that mark. Symbol, if used, must be registered with the Bureau of Explosives.

§ 178.150 Specification 33A; polystyrene cases. Nonreusable containers.

§ 178.150-1 Material requirements.

(a) Expandable polystyrene, molded to produce a completely fused closed cell composition having a minimum density of 1.25 pounds per cubic foot.

§ 178.150-2 Design.

(a) The case is to consist of two parts, a bottom section with pockets for the inside containers and a top section that covers, and interlocks with the bottom section. Both the bottom and top sections shall be designed to provide a snug fit for the inside containers.

§ 178.150-3 Construction.

(a) The case shall be constructed in accordance with the following minimum thicknesses:

(1) Multiple bottle cases, not more than four individual bottles per case;

	Nominal capacity of individual inside containers	
	5 pints	1 gallon
Sidewall and bottom inches...	$\frac{3}{4}$	1
Between inside containers, inches.....	$\frac{5}{8}$	$\frac{3}{4}$
Top, inches (see Note 1).....	$\frac{3}{4}$	1

NOTE 1: In recess for closure cap for inside container, $\frac{1}{4}$ -inch thickness is permissible; closure cap shall not be in contact with inside of top section.

(2) Single bottle cases:

	Nominal capacity of inside containers			
	Pint	Quart	5 pints	Gallon
Side wall, inches.....	$\frac{3}{8}$	$\frac{5}{8}$	$\frac{3}{4}$	$1\frac{1}{2}$
Top wall, inches.....	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{3}{4}$	1
Bottom wall, inches..	1	1	$\frac{3}{4}$	$1\frac{1}{2}$

§ 178.150-4 Closing for shipment.

(a) Cases shall be closed for shipment with a pressure-sensitive tape having a tensile strength of not less than 55 pounds per inch of width or tape of equivalent strength. The tape shall completely encircle the case, with overlap of not less than 1 inch, in one direction so as to transverse the joint of the two sections perpendicularly. If the design of the case is such that the tape is subject to abrasion in transportation and handling, tape shall also be applied similarly on the same axis, but at 90°.

(1) For multiple bottle case, tape width shall not be less than $1\frac{1}{4}$ inches.

(2) For single bottle case, tape width shall not be less than three-fourths inch.

§ 178.150-5 Gross weight authorized.

(a) Multiple bottle case, 60 pounds maximum.

(b) Single bottle case, 20 pounds maximum.

§ 178.150-6 Test for completed package.

(a) Cases, with inside containers filled with water enclosed as for shipment, shall be capable of withstanding 4-foot flap drops onto solid concrete without leakage from or breakage of any inside container, and without producing any condition that would result in potential damage to the inside container. A minimum of four cases shall be tested, each case not being subjected to more than one test. Each test is to consist of six 4-foot drops once each side, bottom and top.

(b) Tests prescribed by paragraph (a) of this section must be conducted by the

shipper assembling the completed package prior to initial use, and each 6 months thereafter. The tests must also be repeated on the change of any components or design of the package. Records of tests and results must be maintained for at least 1 year.

§ 178.150-7 Marking.

(a) Each container must be marked as follows:

- (1) DOT-33A.
- (2) The letters "NRC", located just above or below the DOT mark, to indicate a nonrenewable container.
- (3) Name or symbol of person making the other marks specified in this section and located on the same face as those other marks. Symbol, if used, must be registered with the Bureau of Explosives.
- (4) Size of markings: Specification markings prescribed in this section must be at least $\frac{1}{4}$ inch high. All markings must be legible.

Subpart E—Specifications for Wooden Barrels, Kegs, Boxes, Kits, and Drums

§ 178.156 Specification 10B; wooden barrels and kegs (tight).

§ 178.156-1 Compliance.

(a) Required in all details.

§ 178.156-2 Staves and heading.

(a) To be of white oak, chestnut oak, red oak, black cherry, Douglas fir, beech, sweet birch, yellow birch, sugar (hard) maple, or Scandinavian pine; quarter sawed with the grain, from straight-grained timber, so no annual ring shall slope over half the thickness of stave or head; thoroughly kiln dried, moisture content 7 percent to 11 percent; free from rotten sap, checks, pitch pockets, cat faces, seed and worm holes in excess of 15 in one container, and other defects that show through on both sides.

§ 178.156-3 Hoops.

(a) To be of cooperage-grade hoop steel.

§ 178.156-4 Staves.

(a) Staves to be sawed evenly and circular; croze center to be within $1\frac{1}{8}$ "

of end of stave; stave end to have $\frac{1}{8}$ " free from bevel.

§ 178.156-5 Heading.

(a) Heading of uniform thickness and properly circled; planed on outside and properly jointed and glued, or doweled and flagged; dowel diameter not over $\frac{5}{12}$ " thickness of head.

§ 178.156-6 The barrel.

(a) Stave joints reasonably flush on outside. Lathing is forbidden.

(b) Worm and seed holes to be plugged; over 15 not authorized in one container.

§ 178.156-7 Parts required and dimensions.

(a) Parts required and dimensions as follows (10 percent excess capacity authorized):

(1) Staves, when finished on outside:

Capacity of container, not over	Maximum			Minimum	
	Length	Width	Biige Circle	Staves	Thickness
<i>Gallons</i>	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>	<i>Number</i>	<i>Inch</i>
50.....	34	6	84	19	$1\frac{1}{2}$
30.....	30	5	74	16	$\frac{5}{8}$
15.....	24	$4\frac{1}{2}$	54	14	$\frac{9}{16}$
10.....	22	$4\frac{1}{4}$	50	12	$\frac{1}{2}$
5.....	18	4	40	10	$\frac{1}{2}$

Foregoing thicknesses are of staves finished on one side. One-sixteenth inch must be added for unfinished staves. Foregoing maximum lengths are authorized to be increased 6 percent or less, provided the thickness of stave is increased at least one-sixteenth inch for each increase of 1 inch in length or fraction thereof.

(2) Heading, after planing:

Capacity of container, not over	Maximum		Minimum	
	Pieces	Diameter	Thickness	Width
<i>Gallons</i>	<i>Number</i>	<i>Inches</i>	<i>Inch</i>	<i>Inches</i>
50.....	6	21	$\frac{3}{4}$	$2\frac{1}{2}$
30.....	6	18	$\frac{5}{8}$	$2\frac{1}{2}$
15.....	5	14	$\frac{9}{16}$	2
10.....	5	13	$\frac{1}{2}$	2
5.....	4	11	$\frac{1}{2}$	2

NOTE 1: Because of the present emergency and until further order of the Department, for barrels of not over 50 gallons capacity, maximum number of pieces may be 7 provided they have a minimum thickness of $\frac{3}{8}$ inch.

(3) Hoops, number and size:

Capacity of container, not over (gallons)	Minimum number of hoops	Minimum size of hoops inches in width and Birmingham gauge)							
		Head		First quarter		Second quarter		Bilge	
		Inch	Gauge	Inch	Gauge	Inch	Gauge	Inch	Gauge
20	8	3 1/4	17	1 1/2	18	1 1/2	18	3 1/4	17
30	6	1 1/2	18	1 1/2	18			1 1/2	18
15	6	1 1/4	19	1 1/4	19			1 1/4	19
10	6	1 1/4	19	1	19			1 1/4	19
5	6	1	19	1	19			1	19

¹ Because of the present emergency and until further order of the Department, the minimum number of hoops is authorized to be reduced to 6 by eliminating second quarter hoops.

² Because of the present emergency and until further order of the Department, the minimum number of hoops is authorized to be reduced to 4 by eliminating first quarter hoops if head and bilge hoops of 1 1/4 inch by 17 gauge are used.

³ 2 inch by 18 gauge hoops are also authorized.

§ 178.156-8 Closures.

(a) To be such as to prevent leakage in transit. Bungholes in staves must be not over 2" diameter.

§ 178.156-9 Lining.

(a) To be as prescribed in Part 173 of this chapter or otherwise appropriate for the contents.

§ 178.156-10 Type test.

(a) Sample container at least 2 days old shall not increase more than 10 percent on diameter of head when all hoops above bilge are removed.

§ 178.156-11 Leakage test.

(a) Required for each lined container by pressure at time of sizing or air pressure of at least 5 pounds per square inch; leakers to be repaired and retested.

§ 178.156-12 Marking.

(a) Marking on each container by the maker. By hot branding iron on head as follows:

(1) DOT-10B.

(2) Name or symbol of person making the mark specified in paragraph (a) (1) of this section and located just above, below, or following that mark. Symbol, if used, must be registered with the Bureau of Explosives.

(3) Date of manufacture (for example, 7-50 for July 1950) located near the maker's mark.

NOTE 1: Because of the present emergency and until further order of the Department, date of manufacture may be omitted.

§ 178.156-13 Size of markings.

(a) Size of markings (minimum); 3/4" high for over 30-gallon size, 1 1/2" for others.

§ 178.165 Specification 14; wooden boxes, nailed.

§ 178.165-1 Compliance.

(a) Required in all details.

§ 178.165-2 Lumber.

(a) White pine or wood of at least equal strength, well seasoned, commercially dry, and free from decay, loose knots, knots that would interfere with nailing, and other defects that would materially lessen the strength. Grain of wood in cleats must not cross cleat within one-half its length.

§ 178.165-3 Nails.

(a) Cement coated, except as otherwise authorized, or screws of equal efficiency.

§ 178.165-4 Ends, sides, tops, and bottoms.

(a) Ends, sides, tops, and bottoms as follows:

(1) Parts of 1-piece.

(2) Parts Linderman-joint glued.

(3) Parts tongued, grooved, and glued.

(4) Parts butt-joint glued, provided the joined surfaces are planed before gluing so as to assure full contact. After immersion in water for 24 hours at 70° F, the part must not fail at the joint when it is broken.

(b) Tongued, grooved and glued joints in uncled end; must also be fastened with corrugated fasteners not over 8" apart, within 3" of each end of joint and having penetration 4/5 thickness of end.

§ 178.165-5 Cleated ends.

(a) Double cleated, 2 vertical and 2 horizontal. Nails staggered at 2" intervals and clinched; cement coating not required.

§ 178.165-6 Sides, tops, and bottoms.

(a) Of size to extend out over cleats, if any.

§ 178.165-7 Lock and dovetail corners.

(a) Glued.

§ 178.165-8 Parts and dimensions.

(a) Parts and dimensions as follows:

Authorized gross weight (maximum pounds)	Type of box	Thickness of lumber (minimum)				Nails (minimum size) ⁴	
		Ends ¹	Sides	Tops and bottoms ²	Cleats	Into ends or cleats	Into sides
		Inches	Inch	Inch	Inches	Penny	Penny
35	(Lock ¹)	7/16	7/16	7/16		5d	5d
	(Corner.....)						
65	(Lock ¹)	1/2	1/2	3/4		5d	5d
	(Corner.....)						
75	(Plain.....)	7/8	1/2	1/2		7d	5d
	(Nailed.....)						
75	(Double.....)	3/4	3/4	3/4	1/2 x 1 1/2	5d	
	(Cleat.....)						
140	(Plain.....)	1 1/2	5/8	5/8		8d	7d
	(Nail.....)						
140	(Lock ¹)	5/8	5/8	5/8		7d	7d
	(Corner.....)						
140	(Double.....)	1	5/8	5/8	3/4 x 1 3/4	7d	7d
	(Cleat.....)						

¹ Or dovetail.

² Tops and bottoms may be made of paper covered veneer board of good quality Douglas fir, or lumber of equal quality, having minimum thickness of 1/4 inch and free from decay, objectionable knots that interfere with nailing, splits, gaps, and other defects that materially lessen the strength. Paper covering shall be at least Kraft untreated liner-board having a basis weight of 42 pounds per 1,000 square feet and shall be secured to veneer core by adhesive in such manner as to form a satisfactorily laminated board. Board ends must be provided with such reinforcement as may be necessary to provide strength for nailing.

³ As provided by § 178.65(a)(1), Note 1, of this chapter, boxes, having inside metal containers which are tightly and securely closed, may be equipped with hand holes in each end which must be not more than one inch by four inches and centered laterally not nearer than 1 3/4 inches from top edge of end of box.

⁴ Coated wire staples are authorized in lieu of nails when used for fastening tops to boxes. Staples must be of such size and spaced and driven as to provide closure efficiency equivalent to that in §§ 178.165-11 and 178.165-12.

§ 178.165-9 Joints in sides and ends.

(a) Staggered; except for ends cleated as prescribed.

§ 178.165-10 Tops and bottoms.

(a) Must fit evenly on frame of box.

§ 178.165-11 Cleated boxes.

(a) Sides, top, and bottom must be secured to ends by nails driven into cleats, not into end boards.

§ 178.165-12 Nails in each nailing edge (minimum numbers).

(a) At least equal to length of edge in inches divided by 2; when number of nails is at least equal to length of edge divided by 1 3/4, 4d nails are authorized where 5d nails are prescribed.

Exception: Eight inch spacing authorized for nailing tops and bottoms to sides.

NOTE 1: Because of the present emergency and until further order of the Department, the following exception is authorized for nailing tops to boxes: When 7d and 8d nails are required by § 178.165-8, 6d nails are authorized if number of nails used is at least equal to length of end edge divided by 1 3/4 and length of side edge divided by 6.

§ 178.165-13 Marking.

(a) Marking on each box with letters and figures at least 1/2" high in rectangle as follows:

DOT-14

(b) Each box must also be marked with the name or symbol of person making the mark specified in paragraph (a) of this section. Symbol, if used, must be registered with the Bureau of Explosives.

§ 178.168 Specification 15A; wooden boxes, nailed.

§ 178.168-1 Compliance.

(a) Required in all details.

§ 178.168-2 Closed ¹ box.

(a) Parts and pieces to be in close contact.

§ 178.168-3 Ends.

(a) One-piece, or equivalent (see § 178.168-5), or cleated as prescribed; joints tongued, grooved, and glued. Style 1 or style 6 boxes may have milled depressions in each end of box for hand-holds, of not more than 3/8 inch in

¹ Openings for filling device of inside container authorized if device is properly protected.

depth and not exceeding one-third of the width of the box, only when ends are of lumber at least $\frac{3}{4}$ inch in thickness.

(b) As provided by § 173.65 (a) (1), Note 1, of this chapter, wooden boxes having inside metal containers which are tightly and securely closed, may be equipped with hand holes in each end which must be not more than one inch by four inches and centered laterally not nearer than $1\frac{5}{8}$ inches from top edge of end of box.

§ 173.168-4 Sides, top, and bottom.

(a) Joints tongued, grooved, and glued, or one-piece equivalent, except that boxes for shipment of high explosives may have tops and bottoms made of paper-covered veneer board of good quality Douglas fir, or lumber of equal quality, having minimum thickness of $\frac{1}{8}$ inch and free from decay, objectionable knots that interfere with nailing, splits, gaps, and other defects that materially lessen the strength. Papers covering shall be at least kraft untreated linerboard having a basis weight of 42 pounds per 1,000 square feet and shall be secured to veneer core by adhesive in such manner as to form a satisfactorily laminated board. Board ends must be provided with such reinforcement as may be necessary to provide strength for nailing, and when used lumber thicknesses specified by § 173.168-12 do not apply.

§ 173.168-5 One-piece equivalents.

(a) Parts are considered equivalent to one-piece as follows:

(1) Parts Linderman-joint glued.

(2) Parts at least $\frac{1}{2}$ " thick, tongued and grooved and glued, with 2 or more corrugated fasteners on each joint.

(3) Parts butt-joint glued, provided the joined surfaces are planed before gluing, so as to assure full contact. After immersion in water for 24 hours at 70° F. the part must not fail at the joint when it is broken.

(b) Corrugated fasteners (as prescribed for one-piece equivalents): 1" wide; penetration $\frac{4}{5}$ thickness of part; within 3" of end of joint and not over 8" apart; for 3 or more, drive alternately into opposite sides of part.

§ 173.168-6 Gluing efficiency.

(a) Shall be determined for boxes for gross weight of 150 pounds or less. When filled with sand and sawdust to marked gross weight, the boxes must be able to withstand 8 drops of 12", one on each

corner, onto solid concrete without exposure of contents.

§ 173.168-7 Lumber.

(a) To be well seasoned, commercially dry, and free from decay, loose knots that would interfere with nailing, and other defects that would materially lessen the strength. Grain of wood in cleats must not cross cleats within $\frac{1}{2}$ its length.

§ 173.168-8 Nails.

(a) Cement coated, unless otherwise authorized herein, of size specified for "sinkers" and "coolers" as generally known to the trade.

§ 173.168-9 Grouping of principal woods.

(a) Grouping as follows:

GROUP 1

White pine.	Chestnut.
Norway pine.	Sugar pine.
Aspen (popple).	Cypress.
Spruce.	Basswood.
Western (yellow) pine.	Willow.
Cottonwood.	Noble fir.
Balsam fir.	Magnolia.
Yellow poplar.	Buckeye.
Cedar.	White fir.
Redwood.	Alpine fir.
Butternut.	Lodgepole pine
Cucumber.	Jack pine.

GROUP 2

Southern yellow pine.	Douglas fir.
Hemlock.	Larch (tamarack)
North Caroline pine.	

GROUP 3

White elm.	Black gum.
Red gum.	Black ash.
Sycamore.	Tupelo.
Pumpkin ash.	Maple—soft or silver.

GROUP 4

Hard maple.	Birch.
Beech.	Rock elm.
Oak.	Hickory.
Hackberry.	White ash.

§ 173.168-10 Width of pieces.

(a) At least $2\frac{1}{2}$ ".

§ 173.168-11 Width of cleats.

(a) Twice the prescribed thickness plus $\frac{3}{4}$ ".

§ 173.168-12 Thickness of lumber.

(a) Nailed boxes not cleated (Style 1). Authorized gross weight not over 100 pounds, see Note 1. Sides as in Table 1; top and bottom as in Table 1A; ends as in Table 5.

(b) Glued-lock-corner boxes (Style 6). Authorized gross weight not over 150

pounds. Sides as in Table 3; top and bottom as in Table 1A; ends as in Table 3A. Or, sides as in Table 2; top and bottom as in Table 1A; end as in Table 4.

(c) Singled-cleated boxes (Style 4 or 5). Authorized gross weight not over 200 pounds, see Note 2. Sides as in Table 1; top and bottom as in Table 1A; ends and cleats as in Table 3A.

(d) Double-cleated boxes (Style 2, 2½, or 3). Authorized gross weight not over 500 pounds. See Note 3. Sides as in Table 1; top and bottom as in Table 1A; end and cleats as in Table 2A. Or, sides as in Table 1; top and bottom as in Table 1A; cleats as in Table 3B; ends not thinner than thickest side or top.

NOTE 1: When group 2 woods are used the gross weight may be increased to 110 pounds.

NOTE 2: When group 2 woods are used the gross weight may be increased to 220 pounds.

NOTE 3: When group 2 woods are used the gross weight may be increased to 550 pounds.

(e) Tables are as follows (dimensions of materials finished or resawed):

TABLE 1

Depth of box (inches)	Not over 8"	Not over 9"	Not over 10"	Not over 12"	Not over 14"	Over 14"
Authorized gross weight (pounds)	Minimum thickness of part					
	<i>Inches</i>	<i>Inches</i>	<i>Inch</i>	<i>Inch</i>	<i>Inch</i>	<i>Inch</i>
15	5/16	5/16	5/16	5/16	5/16	5/16
25	5/16	5/16	5/16	5/16	5/16	5/16
35	5/16	5/16	5/16	5/16	5/16	5/16
45	11/32	11/32	11/32	11/32	11/32	11/32
55	3/8	11/32	11/32	11/32	11/32	11/32
65	3/8	3/8	11/32	11/32	11/32	11/32
75	7/16	3/8	3/8	11/32	11/32	11/32
85	7/16	7/16	3/8	11/32	11/32	11/32
100	1/2	7/16	7/16	3/8	11/32	11/32
125	9/16	1/2	1/2	7/16	3/8	3/8
150	5/8	9/16	9/16	1/2	7/16	3/8
175	5/8	5/8	9/16	1/2	1/2	7/16
200	11/16	5/8	5/8	1/2	1/2	7/16
250	25/32	3/4	11/16	5/8	9/16	1/2
300	13/16	13/16	3/4	11/16	5/8	9/16
350	15/16	7/8	13/16	3/4	11/16	5/8
400	1	15/16	7/8	13/16	3/4	11/16
500	1 1/8	1 1/16	1	15/16	7/8	3/4

TABLE 1A

Width of box (inches)	Not over 8"	Not over 9"	Not over 10"	Not over 12"	Not over 14"	Over 14"
Authorized gross weight (pounds)	Minimum thickness of part					
	<i>Inches</i>	<i>Inches</i>	<i>Inch</i>	<i>Inch</i>	<i>Inch</i>	<i>Inch</i>
15	5/16	5/16	5/16	5/16	5/16	5/16
25	5/16	5/16	5/16	5/16	5/16	5/16
35	5/16	5/16	5/16	5/16	5/16	5/16
45	11/32	11/32	11/32	11/32	11/32	11/32
55	3/8	11/32	11/32	11/32	11/32	11/32
65	3/8	3/8	11/32	11/32	11/32	11/32
75	7/16	3/8	3/8	11/32	11/32	11/32
85	7/16	7/16	3/8	1/2	11/32	11/32
100	1/2	7/16	7/16	3/8	1/2	11/32
125	9/16	1/2	1/2	7/16	3/8	3/8
150	5/8	9/16	9/16	1/2	7/16	3/8
175	5/8	5/8	9/16	1/2	1/2	7/16
200	11/16	5/8	5/8	1/2	1/2	7/16
250	25/32	3/4	11/16	5/8	9/16	1/2
300	13/16	13/16	3/4	11/16	5/8	9/16
350	15/16	7/8	13/16	3/4	11/16	5/8
400	1	15/16	7/8	13/16	3/4	11/16
500	1 1/8	1 1/16	1	15/16	7/8	3/4

TABLE 2

Depth of box (inches)	Not over 8"	Not over 9"	Not over 10"	Not over 12"	Not over 14"	Over 14"
Authorized gross weight (pounds)	Minimum thickness of part					
	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>	<i>Inch</i>	<i>Inch</i>
15	11/32	11/32	11/32	11/32	11/32	11/32
25	11/32	11/32	11/32	11/32	11/32	11/32
35	3/8	11/32	11/32	11/32	11/32	11/32
45	7/16	3/8	3/8	11/32	11/32	11/32
55	1/2	7/16	3/8	5/8	11/32	11/32
65	1/2	1/2	7/16	5/8	3/8	11/32
75	9/16	1/2	1/2	7/16	5/8	5/8
85	9/16	9/16	1/2	7/16	7/16	5/8
100	5/8	9/16	9/16	1/2	7/16	7/16
125	11/16	5/8	5/8	9/16	1/2	7/16
150	3/4	11/16	11/16	5/8	9/16	1/2
175	13/16	3/4	11/16	11/16	5/8	9/16
200	7/8	13/16	3/4	3/4	11/16	5/8
250	1	15/16	7/8	13/16	3/4	5/8
300	1 1/16	1	15/16	7/8	25/32	11/16
350	1 1/8	1 1/16	1	15/16	7/8	3/4
400	1 3/16	1 1/8	1 1/16	1	15/16	13/16
500			1 1/8	1 1/16	1	7/8

TABLE 2A

	Smallest di- mension of end	Not over 8"	Not over 9"	Not over 10"	Not over 12"	Not over 14"	Over 14"
	Authorized gross weight (pounds)	Minimum thickness of part					
		<i>Inches</i>	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>	<i>Inch</i>	<i>Inch</i>
15.		11/32	11/32	11/32	11/32	11/32	11/32
25		7/16	7/16	7/16	7/16	7/16	7/16
35		7/16	7/16	7/16	7/16	7/16	7/16
45		7/16	7/16	7/16	7/16	7/16	7/16
55		1/2	7/16	7/16	7/16	7/16	7/16
65		1/2	7/16	7/16	7/16	7/16	7/16
75		1/2	1/2	7/16	7/16	7/16	7/16
85		9/16	9/16	1/2	1/2	7/16	7/16
100		5/8	9/16	1/2	1/2	7/16	7/16
125		11/16	5/8	5/8	9/16	1/2	7/16
150		3/4	11/16	11/16	5/8	9/16	1/2
175		13/16	3/4	11/16	11/16	5/8	11/16
200		7/8	13/16	3/4	3/4	11/16	5/8
250		1	15/16	7/8	13/16	3/4	5/8
300		11/16	1	15/16	7/8	25/32	11/16
350		11/8	11/8	1	7/16	7/8	11/8
400		11/8	11/8	11/8	1	15/16	7/8
500				11/8	11/8	1	11/8

TABLE 3.A

Smallest dimension of end	Not over 8"	Not over 9"	Not over 10"	Not over 12"	Not over 14"	Over 14"
Author:zed gross weight (pounds)	Minimum thickness of part					
	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>
15	11/32	11/32	11/32	11/32	11/32	11/32
25	7/16	7/16	7/16	7/16	7/16	7/16
35	7/16	7/16	7/16	7/16	7/16	7/16
45	1/2	1/2	7/16	7/16	7/16	7/16
55	1/2	1/2	1/2	1/2	7/16	7/16
65	1/2	1/2	1/2	1/2	7/16	7/16
75	1/2	1/2	1/2	1/2	7/16	7/16
85	11/16	11/16	5/8	1/2	1/2	1/2
100	3/4	11/16	11/16	5/8	2/4	2/4
125	13/16	3/4	3/4	11/16	5/8	5/8
150	15/16	3/4	11/16	3/4	11/16	11/16
175	1	15/16	7/4	11/16	3/4	11/16
200	11/16	1	15/16	7/4	25/32	11/16
250	11/16	11/16	1	15/16	7/4	25/32
300	11/16	11/16	11/16	11/16	15/16	7/4
350		15/16	11/4	11/8		15/16
400				11/4		1
500					11/4	11/8

TABLE 3

Depth of box (inches)	Not over 8"	Not over 9"	Not over 10"	Not over 12"	Not over 14"	Over 14"
Authorized gross weight (pound)	Minimum thickness of part					
15	$\frac{1}{16}$	$\frac{3}{16}$	$\frac{5}{16}$	$\frac{3}{16}$	$\frac{5}{16}$	$\frac{5}{16}$
25	$\frac{3}{8}$	$\frac{11}{32}$	$\frac{11}{32}$	$\frac{11}{32}$	$\frac{11}{32}$	$\frac{11}{32}$
35	$\frac{7}{16}$	$\frac{7}{16}$	$\frac{3}{8}$	$\frac{11}{32}$	$\frac{11}{32}$	$\frac{11}{32}$
45	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{7}{16}$	$\frac{7}{16}$	$\frac{3}{8}$	$\frac{11}{32}$
55	$\frac{9}{16}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{7}{16}$	$\frac{3}{8}$	$\frac{3}{8}$
65	$\frac{9}{16}$	$\frac{9}{16}$	$\frac{9}{16}$	$\frac{1}{2}$	$\frac{7}{16}$	$\frac{7}{16}$
75	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{9}{16}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{7}{16}$
85	$\frac{11}{16}$	$\frac{11}{16}$	$\frac{3}{8}$	$\frac{9}{16}$	$\frac{1}{2}$	$\frac{1}{2}$
100	$\frac{3}{4}$	$\frac{11}{16}$	$\frac{11}{16}$	$\frac{3}{4}$	$\frac{9}{16}$	$\frac{1}{2}$
125	$\frac{13}{16}$	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{11}{16}$	$\frac{3}{4}$	$\frac{9}{16}$
150	$\frac{15}{16}$	$\frac{15}{16}$	$\frac{13}{16}$	$\frac{3}{4}$	$\frac{11}{16}$	$\frac{3}{4}$
175	1	$\frac{15}{16}$	$\frac{7}{8}$	$\frac{13}{16}$	$\frac{3}{4}$	$\frac{11}{16}$
200	$\frac{1}{16}$	1	$\frac{15}{16}$	$\frac{7}{8}$	$\frac{25}{32}$	$\frac{11}{16}$
250	$\frac{1}{8}$	$\frac{11}{16}$	1	$\frac{15}{16}$	$\frac{7}{8}$	$\frac{25}{32}$
300	$\frac{1}{8}$	$\frac{11}{16}$	$\frac{11}{16}$	$\frac{15}{16}$	$\frac{15}{16}$	$\frac{7}{8}$
350	$\frac{1}{8}$	$\frac{13}{16}$	$\frac{1}{4}$	$\frac{1}{8}$	1	$\frac{15}{16}$
400				$\frac{1}{4}$	$\frac{11}{16}$	1
500					$\frac{11}{16}$	$\frac{11}{16}$

TABLE 3B

Smallest dimension of end	Not over 8"	Not over 9"	Not over 10"	Not over 12"	Not over 14"	Over 14"
Authorized gross weight (pounds)	Minimum thickness of part					
	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>
15	$\frac{7}{16}$	$\frac{7}{16}$	$\frac{7}{16}$	$\frac{7}{16}$	$\frac{7}{16}$	$\frac{7}{16}$
25	$\frac{7}{16}$	$\frac{7}{16}$	$\frac{7}{16}$	$\frac{7}{16}$	$\frac{7}{16}$	$\frac{7}{16}$
35	$\frac{7}{16}$	$\frac{7}{16}$	$\frac{7}{16}$	$\frac{7}{16}$	$\frac{7}{16}$	$\frac{7}{16}$
45	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{7}{16}$	$\frac{7}{16}$	$\frac{7}{16}$	$\frac{7}{16}$
55	$\frac{9}{16}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{7}{16}$	$\frac{7}{16}$	$\frac{7}{16}$
65	$\frac{9}{16}$	$\frac{9}{16}$	$\frac{9}{16}$	$\frac{1}{2}$	$\frac{7}{16}$	$\frac{7}{16}$
75	$\frac{8}{8}$	$\frac{8}{8}$	$\frac{9}{16}$	$\frac{1}{2}$	$\frac{7}{16}$	$\frac{7}{16}$
85	$\frac{11}{16}$	$\frac{11}{16}$	$\frac{5}{8}$	$\frac{9}{16}$	$\frac{1}{2}$	$\frac{1}{2}$
100	$\frac{3}{4}$	$\frac{11}{16}$	$\frac{11}{16}$	$\frac{5}{8}$	$\frac{9}{16}$	$\frac{1}{2}$
125	$\frac{13}{16}$	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{11}{16}$	$\frac{5}{8}$	$\frac{9}{16}$
150	$\frac{15}{16}$	$\frac{7}{8}$	$\frac{13}{16}$	$\frac{3}{4}$	$\frac{11}{16}$	$\frac{5}{8}$
175	1	$\frac{15}{16}$	$\frac{7}{8}$	$\frac{13}{16}$	$\frac{3}{4}$	$\frac{11}{16}$
200	$\frac{11}{16}$		$\frac{15}{16}$	$\frac{11}{16}$	$\frac{25}{32}$	$\frac{11}{16}$
250	$\frac{11}{16}$	$\frac{11}{16}$	1	$\frac{15}{16}$	$\frac{7}{8}$	$\frac{25}{32}$
300	$\frac{11}{16}$	$\frac{11}{16}$	$\frac{11}{16}$	$\frac{15}{16}$	$\frac{15}{16}$	$\frac{11}{16}$
350	$\frac{11}{16}$	$\frac{11}{16}$	$\frac{11}{16}$	$\frac{11}{16}$	1	$\frac{15}{16}$
400				$\frac{11}{16}$	$\frac{11}{16}$	1
500				$\frac{11}{16}$	$\frac{11}{16}$	$\frac{11}{16}$

TABLE 4

Smallest dimension of end	Not over 8"	Not over 9"	Not over 10"	Not over 12"	Not over 14"	Over 14"
Authorized gross weight (pounds)	Minimum thickness of part					
	Inch	Inch	Inch	Inch	Inch	Inch
15.....	$\frac{5}{16}$	$\frac{7}{16}$	$\frac{7}{16}$	$\frac{7}{16}$	$\frac{7}{16}$	$\frac{7}{16}$
25.....	$\frac{7}{16}$	$\frac{7}{16}$	$\frac{7}{16}$	$\frac{7}{16}$	$\frac{7}{16}$	$\frac{7}{16}$
35.....	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$
45.....	$\frac{5}{16}$	$\frac{9}{16}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{7}{16}$
55.....	$\frac{3}{8}$	$\frac{9}{16}$	$\frac{9}{16}$	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{7}{16}$
65.....	$\frac{11}{16}$	$\frac{3}{4}$	$\frac{9}{16}$	$\frac{9}{16}$	$\frac{1}{2}$	$\frac{5}{8}$
75.....	$\frac{1}{2}$	$\frac{11}{16}$	$\frac{3}{4}$	$\frac{5}{8}$	$\frac{1}{2}$	$\frac{5}{8}$
85.....	$\frac{25}{32}$	$\frac{3}{4}$	$\frac{11}{16}$	$\frac{5}{8}$	$\frac{5}{8}$	$\frac{9}{16}$
100.....	$\frac{7}{8}$	$\frac{11}{16}$	$\frac{3}{4}$	$\frac{11}{16}$	$\frac{5}{8}$	$\frac{9}{16}$
125.....	$\frac{1}{2}$	$\frac{7}{8}$	$\frac{11}{16}$	$\frac{3}{4}$	$\frac{11}{16}$	$\frac{5}{8}$
150.....	1	$\frac{11}{16}$	$\frac{11}{16}$	$\frac{7}{8}$	$\frac{11}{16}$	$\frac{11}{16}$

TABLE 5

Smallest dimension of end	Not over 8"	Not over 9"	Not over 10"	Not over 12"	Not over 14"	Over 14"
Authorized gross weight (pounds)	Minimum thickness of part					
	Inch	Inch	Inch	Inch	Inch	Inch
15.....	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$
25.....	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$
35.....	$\frac{3}{8}$	$\frac{9}{16}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$
45.....	$\frac{11}{16}$	$\frac{5}{8}$	$\frac{9}{16}$	$\frac{9}{16}$	$\frac{1}{2}$	$\frac{1}{2}$
55.....	$\frac{3}{4}$	$\frac{11}{16}$	$\frac{5}{8}$	$\frac{5}{8}$	$\frac{9}{16}$	$\frac{1}{2}$
65.....	$\frac{11}{16}$	$\frac{3}{4}$	$\frac{11}{16}$	$\frac{5}{8}$	$\frac{5}{8}$	$\frac{3}{4}$
75.....	$\frac{7}{8}$	$\frac{11}{16}$	$\frac{3}{4}$	$\frac{11}{16}$	$\frac{5}{8}$	$\frac{9}{16}$
85.....	$\frac{11}{16}$	$\frac{7}{8}$	$\frac{11}{16}$	$\frac{3}{4}$	$\frac{11}{16}$	$\frac{5}{8}$
100.....	1	$\frac{11}{16}$	$\frac{7}{8}$	$\frac{11}{16}$	$\frac{3}{4}$	$\frac{11}{16}$

§ 178.168-13 Reduced thicknesses.

(a) Reduction in thicknesses is authorized as in paragraphs (a) to (d) of this section except that reduced thicknesses must be not less than:

(1) Sides, top, and bottom: Minimum $\frac{5}{16}$ " for boxes up to 35 pounds authorized gross weight and $\frac{3}{8}$ " above that weight.

(2) Ends or cleats: Minimum $\frac{7}{16}$ ".

(b) Sides of one-piece or equivalent 12½ percent.

(c) Any part or cleat of Group 3 or 4 wood; 20 percent.

(d) Sides, top, and bottom when to be strapped as per § 178.168-19 (b); 20 percent for 1 strap; 35 percent for 2 straps.

CONVERSION TABLE

Specified thickness (inches)	Reduced thickness corresponding to percent reduction		
	12½	20	35
$\frac{9}{32}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$
$\frac{5}{16}$	$\frac{9}{32}$	$\frac{1}{4}$	$\frac{1}{4}$
$\frac{11}{32}$	$\frac{5}{16}$	$\frac{9}{32}$	$\frac{1}{4}$
$\frac{3}{8}$	$\frac{5}{16}$	$\frac{5}{16}$	$\frac{1}{4}$
$\frac{1}{2}$	$\frac{3}{4}$	$\frac{11}{32}$	$\frac{9}{32}$
$\frac{5}{8}$	$\frac{7}{16}$	$\frac{3}{4}$	$\frac{5}{16}$
$\frac{3}{4}$	$\frac{1}{2}$	$\frac{7}{16}$	$\frac{3}{8}$
$\frac{7}{8}$	$\frac{9}{16}$	$\frac{1}{2}$	$\frac{7}{16}$
1	$\frac{5}{8}$	$\frac{9}{16}$	$\frac{7}{16}$
$\frac{11}{16}$	$\frac{5}{8}$	$\frac{5}{8}$	$\frac{1}{2}$
$\frac{1}{2}$	$\frac{11}{16}$	$\frac{5}{8}$	$\frac{1}{2}$
$\frac{25}{32}$	$\frac{11}{16}$	$\frac{5}{8}$	$\frac{1}{2}$
$\frac{13}{16}$	$\frac{11}{16}$	$\frac{5}{8}$	$\frac{1}{2}$
$\frac{7}{8}$	$\frac{3}{4}$	$\frac{11}{16}$	$\frac{9}{16}$
$\frac{15}{16}$	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{5}{8}$
1	$\frac{7}{8}$	$\frac{11}{16}$	$\frac{5}{8}$
$\frac{11}{16}$	$\frac{7}{8}$	$\frac{7}{8}$	$\frac{11}{16}$
$\frac{1}{2}$	1	$\frac{7}{8}$	$\frac{3}{4}$
$\frac{13}{16}$	$\frac{11}{16}$	$\frac{11}{16}$	$\frac{25}{32}$
$\frac{1}{2}$	$\frac{13}{16}$	1	$\frac{13}{16}$
$\frac{1}{2}$	$\frac{13}{16}$	$\frac{13}{16}$	$\frac{7}{8}$

§ 178.168-14 Assembly.

(a) By nailing; screws, hinges and hasp, or other device of equal efficiency are authorized; nails should be driven flush.

§ 178.168-15 Nails and nailing.

(a) Cement coated of gauge and with spacing detailed in §§ 178.168-16 and 178.168-17.

(b) At cleated edges drive at least 40 percent of nails into cleats.

(c) Nails fastening cleats to be staggered and clinch $\frac{1}{8}$ "; uncoated nails authorized.

(d) Nailing tops and bottoms to sides permitted but not required.

§ 178.168-16 Nails; kind and dimensions.

(a) Cement¹ coated of gauge and length as for "sinkers" and "coolers" as generally known to the trade; size² in "penny" as follows:

¹ Uncoated nails authorized when increased 25 percent in number.

² Nails 1-penny smaller authorized when spaced as for 2-penny smaller. Nails 2-penny smaller authorized, but not less than 3-penny when thickness of material nailed through does not exceed $\frac{1}{2}$ of thickness of material holding points of nails.

Species of wood holding points of nails	Thickness of material holding points of nails (inches)										
	$\frac{3}{8}$ or less	$\frac{1}{16}$	$\frac{1}{2}$	$\frac{7}{16}$	$\frac{5}{8}$	$1\frac{1}{16}$	$\frac{3}{4}$	$2\frac{1}{2}$	$1\frac{3}{16}$	$\frac{7}{8}$	$1\frac{1}{2}$ or more
Group 1.....	4	5	5	6	7	7	8	8	8	9	1
Group 2.....	4	4	5	5	6	6	7	7	7	8	
Group 3.....	3	4	4	5	5	6	6	7	7	7	
Group 4.....	3	3	4	4	4	5	5	6	6	7	

§ 178.168-17 Nail spacing.¹

(a) Nail spacing as follows:

Nails (size)	Maximum spacing when driven into end and cleats	
	Side grain	End grains
	Inches	Inches
Threepenny.....	1 $\frac{1}{4}$	1
Fourpenny.....	1 $\frac{1}{2}$	1 $\frac{1}{4}$
Fivepenny.....	1 $\frac{3}{4}$	1 $\frac{1}{2}$
Sixpenny.....	2	1 $\frac{3}{4}$
Sevenpenny.....	2 $\frac{1}{4}$	2
Eightpenny.....	2 $\frac{1}{2}$	2 $\frac{1}{4}$
Ninepenny.....	2 $\frac{3}{4}$	2 $\frac{1}{2}$
Tenpenny.....	3	2 $\frac{3}{4}$

§ 178.168-18 Marking.

(a) Marking on each box with letters and figures at least $\frac{1}{2}$ " high in rectangle as follows:

DOT-15A***

(1) The stars must be replaced by authorized gross weight (for example, DOT-15A100, etc.).

(b) The words "ONE STRAP", or "TWO STRAPS", etc., when straps are required (see § 178.168-13(d)); this to be placed above or below the rectangle.

(c) Marks may also be applied as follows:

DOT-15A

NO STRAP XXX LBS.
ONE STRAP XXX LBS.
TWO STRAP XXX LBS.

(1) The "X's" must be replaced by authorized gross weights as authorized for the strapping conditions.

(d) Each box must also be marked with the name or symbol of person making the other marks specified in this section. Symbol, if used, must be registered with the Bureau of Explosives.

¹ To determine number of nails, divide length of nailing edge by spacing; fractions greater than $\frac{1}{2}$ are considered as whole numbers.

ing the other marks specified in this section. Symbol, if used, must be registered with the Bureau of Explosives.

§ 178.168-19 Closing for shipment.

(a) Box to be securely closed. Nails, if used, to be as prescribed in §§ 178.168-16 and 178.168-17.

(b) Metal straps, as specified by marks on box, must encircle sides, top, and bottom as follows:

(1) One nailless strap: At center of box.

(2) Two or more nailless straps: Outer two about $\frac{1}{6}$ of box length from ends and other equally spaced between.

(3) Nailed straps: At ends of sides, top, and bottom; use same size nails as for closing and space not over twice as far apart.

(4) Size of flat straps must be as follows:

Authorized gross weight (pounds)	Cross-section size when number of straps is—		
	1	2	3
	Inch	Inch	Inch
50.....	$\frac{1}{2}$ x 0.020	$\frac{3}{8}$ x 0.015	
100.....	$\frac{3}{4}$ x 0.020	$\frac{1}{2}$ x 0.018	
200.....	$\frac{3}{4}$ x 0.023	$\frac{5}{8}$ x 0.020	$\frac{1}{2}$ x 0.018
300.....		$\frac{5}{8}$ x 0.023	$\frac{1}{2}$ x 0.020
400.....		$\frac{3}{4}$ x 0.020	$\frac{1}{2}$ x 0.023
500.....		$\frac{3}{4}$ x 0.023	$\frac{5}{8}$ x 0.023

(5) Wires, Washburn and Moen gauge, authorized as follows:

Authorized gross weight (pounds)	Gauge of wires when number of straps is—		
	1	2	3
50.....	12	14	
100.....	11	12	
200.....	9	11	12
300.....		10	11
400.....		10	11
500.....		9	10

§ 178.169 Specification 15B; wooden boxes, nailed.

§ 178.169-1 Compliance.

(a) Required in all details.

§ 178.169-2 Closed¹ box.

(a) Parts and pieces to be in close contact.

§ 178.169-3 Ends.

(a) One-piece, or equivalent see (§ 178.169-5); or cleated as prescribed with joints tongued and grooved.

§ 178.169-4 Sides, top, and bottom.

(a) Joints tongued and grooved, or one-piece equivalent.

§ 178.169-5 One-piece equivalents.

(a) Parts are considered equivalent to one-piece as follows:

(1) Parts Linderman-joint glued.

(2) Parts at least $\frac{1}{2}$ " thick, tongued and grooved and glued, with 2 or more corrugated fasteners on each joint.

(3) Parts at least $\frac{1}{2}$ " thick, tongued and grooved and fastened with 3 or more corrugated fasteners on each joint.

(4) Parts butt-joint glued, provided the joined surfaces are planed before gluing, so as to assure full contact. After immersion in water for 24 hours at 70° F. the part must not fail at the joint when it is broken.

(b) Corrugated fasteners (as prescribed for one-piece equivalents): 1" wide; penetration $\frac{4}{5}$ thickness of part; within 3" of end of joint and not over 8" apart; for 3 or more, drive alternately into opposite sides of part.

§ 178.169-6 Gluing efficiency.

(a) Shall be determined for boxes for gross weight of 150 pounds or less. When filled with sand and sawdust to marked gross weight, the boxes must be able to withstand 8 drops of 12", one on each corner, onto solid concrete without exposure of contents.

§ 178.169-7 Lumber.

(a) To be well seasoned, commercially dry, and free from decay, loose knots,

knots that would interfere with nailing and other defects that would materially lessen the strength. Grain of wood in cleats must not cross cleat within $\frac{1}{2}$ its length.

§ 178.169-8 Nails.

(a) Cement coated, unless otherwise authorized herein, of size specified for "sinkers" and "coolers" as generally known to the trade.

§ 178.169-9 Grouping of principal woods.

(a) Grouping as follows:

GROUP 1

White pine.	Willow.
Norway pine.	Noble fir.
Aspen (popple).	Magnolia.
Spruce.	Buckeye.
Western (yellow) pine.	White fir.
Cottonwood.	Cedar.
Balsam fir.	Redwood.
Yellow poplar.	Butternut.
Chestnut.	Cucumber.
Sugar pine.	Alpine fir.
Cypress.	Lodgepole pine.
Basswood.	Jack pine.

GROUP 2

Southern yellow pine.	Douglas fir.
Hemlock.	Larch (tamarack)
North Carolina pine.	

GROUP 3

White elm.	Black gum.
Red gum.	Black ash.
Sycamore.	Tupelo.
Pumpkin ash.	Maple—soft or silver.

GROUP 4

Hard maple.	Birch.
Beech.	Rock elm.
Oak.	Hickory.
Hackberry.	White ash.

§ 178.169-10 Width of pieces.

(a) At least $2\frac{1}{2}$ "

§ 178.169-11 Width of cleats.

(a) Twice the prescribed thickness plus $\frac{3}{4}$ ".

§ 178.169-12 Thickness of lumber.

(a) Nailed boxes not cleated (Style 1). Authorized gross weight not over 100 pounds, see Note 1. Sides as in Table 1; top and bottom as in Table 1A; ends as in Table 5.

(b) Glued-lock-corner boxes (Style 6): Authorized gross weight not over 150 pounds. Sides as in Table 3; top and

¹ Openings for filling device of inside container authorized if device is properly protected.

bottom as in Table 1A; ends as in Table 3A. Or, sides as in Table 2; top and bottom as in Table 1A; ends as in Table 4.

(c) Single-cleated boxes (Style 4 or 5): Authorized gross weight not over 200 pounds. see Note 2. Sides as in Table 1; top and bottom as in Table 1A; ends and cleats as in Table 3A.

(d) Double-cleated boxes (Style 2, 2½, or 3): Authorized gross weight not over 500 pounds, see Note 3. Sides as in Table 1; top and bottom as in Table 1A; end and cleats as in Table 2A. Or, sides as in Table 1; top and bottom as in Table 1A; cleats as in Table 3B; ends not thinner than thickest side or top.

NOTE 1: When group 2 woods are used the gross weight may be increased to 110 pounds.

NOTE 2: When group 2 woods are used the gross weight may be increased to 220 pounds.

NOTE 3: When group 2 woods are used the gross weight may be increased to 550 pounds.

(e) Tables are as follows (dimensions of materials finished or resawed).

TABLE 1

Depth of box (inches)	Not over 8"	Not over 9"	Not over 10"	Not over 12"	Not over 14"	Over 14"
Authorized gross weight (pounds)	Minimum thickness of part					
	Inches	Inches	Inches	Inches	Inches	Inches
15.....	3/16	3/16	3/16	3/16	3/16	3/16
25.....	3/16	3/16	3/16	3/16	3/16	3/16
35.....	3/16	3/16	3/16	3/16	3/16	3/16
45.....	1/32	1/32	1/32	1/32	1/32	1/32
55.....	3/8	1/32	1/32	1/32	1/32	1/32
65.....	3/8	3/8	1/32	1/32	1/32	1/32
75.....	7/16	3/8	3/8	1/32	1/32	1/32
85.....	7/16	7/16	3/8	3/8	1/32	1/32
100.....	1/2	7/16	7/16	3/8	3/8	1/32
125.....	9/16	1/2	1/2	7/16	3/8	3/8
150.....	5/8	9/16	9/16	1/2	7/16	3/8
175.....	5/8	5/8	9/16	1/2	1/2	7/16
200.....	1 1/16	5/8	5/8	9/16	1/2	7/16
250.....	2 3/32	3/4	1 1/16	3/4	9/16	3/4
300.....	1 3/16	3/4	3/4	1 1/16	3/4	9/16
350.....	1 3/16	3/4	1 3/16	3/4	1 3/16	3/4
400.....	1	1 3/16	3/4	1 3/16	3/4	1 3/16
500.....	1 1/8	1 3/16	1	1 3/16	3/4	3/4

TABLE 1A

Width of box (inches)	Not over 8"	Not over 9"	Not over 10"	Not over 12"	Not over 14"	Over 14"
Authorized gross weight (pounds)	Minimum thickness of part					
	Inches	Inches	Inches	Inches	Inches	Inches
15.....	3/16	3/16	3/16	3/16	3/16	3/16
25.....	3/16	3/16	3/16	3/16	3/16	3/16
35.....	3/16	3/16	3/16	3/16	3/16	3/16
45.....	1/32	1/32	1/32	1/32	1/32	1/32
55.....	3/8	1/32	1/32	1/32	1/32	1/32
65.....	3/8	3/8	1/32	1/32	1/32	1/32
75.....	7/16	3/8	3/8	1/32	1/32	1/32
85.....	7/16	7/16	3/8	3/8	1/32	1/32
100.....	1/2	7/16	7/16	3/8	3/8	1/32
125.....	9/16	1/2	1/2	7/16	3/8	3/8
150.....	5/8	9/16	9/16	1/2	7/16	3/8
175.....	5/8	5/8	9/16	1/2	1/2	7/16
200.....	1 1/16	5/8	5/8	9/16	1/2	7/16
250.....	2 3/32	3/4	1 1/16	3/4	9/16	3/4
300.....	1 3/16	3/4	3/4	1 1/16	3/4	9/16
350.....	1 3/16	3/4	1 3/16	3/4	1 3/16	3/4
400.....	1	1 3/16	3/4	1 3/16	3/4	1 3/16
500.....	1 1/8	1 3/16	1	1 3/16	3/4	3/4

TABLE 2

Depth of box (inches)	Not over 8"	Not over 9"	Not over 10"	Not over 12"	Not over 14"	Over 14"
Authorized gross weight (pounds)	Minimum thickness of part					
	Inches	Inches	Inches	Inches	Inches	Inches
15.....	1/32	1/32	1/32	1/32	1/32	1/32
25.....	1/32	1/32	1/32	1/32	1/32	1/32
35.....	3/8	1/32	1/32	1/32	1/32	1/32
45.....	7/16	3/8	3/8	1/32	1/32	1/32
55.....	1/2	7/16	3/8	3/8	1/32	1/32
65.....	1/2	1/2	7/16	3/8	3/8	1/32
75.....	9/16	1/2	1/2	7/16	3/8	3/8
85.....	9/16	9/16	1/2	7/16	7/16	3/8
100.....	5/8	9/16	9/16	1/2	7/16	7/16
125.....	1 1/16	5/8	5/8	9/16	5/8	7/16
150.....	3/4	1 1/16	1 1/16	5/8	5/8	7/16
175.....	1 3/16	3/4	1 1/16	1 1/16	5/8	9/16
200.....	7/8	1 3/16	3/4	3/4	1 1/16	5/8
250.....	1	1 3/16	7/8	1 3/16	3/4	5/8
300.....	1 1/16	1	9/16	7/8	2 3/32	1 1/16
350.....	1 3/16	1 3/16	1	1 3/16	7/8	3/4
400.....	1 3/16	1 3/16	1 3/16	1	1 3/16	1 3/16
500.....	1 1/8	1 3/16	1 1/8	1	1	3/4

TABLE 4

Smallest dimension of end	Not over 8"	Not over 9"	Not over 10"	Not over 12"	Not over 14"	Over 14"
Authorized gross weight (pounds)	Minimum thickness of part					
	Inch	Inch	Inch	Inch	Inch	Inch
15.....	$\frac{7}{16}$	$\frac{7}{16}$	$\frac{7}{16}$	$\frac{7}{16}$	$\frac{7}{16}$	$\frac{7}{16}$
25.....	$\frac{7}{16}$	$\frac{7}{16}$	$\frac{7}{16}$	$\frac{7}{16}$	$\frac{7}{16}$	$\frac{7}{16}$
35.....	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{7}{16}$	$\frac{7}{16}$	$\frac{7}{16}$	$\frac{7}{16}$
45.....	$\frac{9}{16}$	$\frac{9}{16}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{7}{16}$	$\frac{7}{16}$
55.....	$\frac{9}{16}$	$\frac{9}{16}$	$\frac{9}{16}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{7}{16}$
65.....	$\frac{11}{16}$	$\frac{9}{16}$	$\frac{9}{16}$	$\frac{9}{16}$	$\frac{1}{2}$	$\frac{1}{2}$
75.....	$\frac{3}{4}$	$\frac{11}{16}$	$\frac{9}{16}$	$\frac{9}{16}$	$\frac{1}{2}$	$\frac{1}{2}$
85.....	$\frac{25}{32}$	$\frac{3}{4}$	$\frac{11}{16}$	$\frac{9}{16}$	$\frac{3}{8}$	$\frac{9}{16}$
100.....	$\frac{7}{8}$	$\frac{13}{16}$	$\frac{3}{4}$	$\frac{11}{16}$	$\frac{9}{16}$	$\frac{9}{16}$
125.....	$\frac{15}{16}$	$\frac{7}{8}$	$\frac{13}{16}$	$\frac{3}{4}$	$\frac{11}{16}$	$\frac{9}{16}$
150.....	1	$\frac{15}{16}$	$\frac{15}{16}$	$\frac{7}{8}$	$\frac{15}{16}$	$\frac{15}{16}$

TABLE 5

Smallest dimension of end	Not over 8"	Not over 9"	Not over 10"	Not over 12"	Not over 14"	Over 14"
Authorized gross weight (pounds)	Minimum thickness of part					
	Inch	Inch	Inch	Inch	Inch	Inch
15.....	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$
25.....	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$
35.....	$\frac{3}{4}$	$\frac{9}{16}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$
45.....	$\frac{11}{16}$	$\frac{9}{16}$	$\frac{9}{16}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$
55.....	$\frac{3}{4}$	$\frac{11}{16}$	$\frac{9}{16}$	$\frac{9}{16}$	$\frac{1}{2}$	$\frac{1}{2}$
65.....	$\frac{13}{16}$	$\frac{3}{4}$	$\frac{11}{16}$	$\frac{9}{16}$	$\frac{9}{16}$	$\frac{9}{16}$
75.....	$\frac{7}{8}$	$\frac{13}{16}$	$\frac{3}{4}$	$\frac{11}{16}$	$\frac{9}{16}$	$\frac{9}{16}$
85.....	$\frac{15}{16}$	$\frac{7}{8}$	$\frac{13}{16}$	$\frac{3}{4}$	$\frac{11}{16}$	$\frac{9}{16}$
100.....	1	$\frac{15}{16}$	$\frac{7}{8}$	$\frac{15}{16}$	$\frac{3}{4}$	$\frac{15}{16}$

§ 178.169-13 Reduced thickness.

(a) Reduction in thicknesses is authorized as in paragraphs (a) to (d) of this section except that reduced thicknesses must be not less than:

(1) Sides, top, and bottom: Minimum $\frac{5}{16}$ " for boxes up to 35 pounds authorized gross weight and $\frac{3}{8}$ " above that weight.

(2) Ends or cleats: Minimum $\frac{7}{16}$ ".

(b) Sides of one-piece or equivalent: 12½ percent.

(c) Any part or cleat of Group 3 or 4 wood: 20 percent.

(d) Sides, top, and bottom when to be strapped as per § 178.169-19(b): 20 percent for 1 strap; 35 percent for 2 straps.

CONVERSION TABLE

Specified thickness (inches)	Reduced thickness corresponding to percent reduction		
	12½	20	35
$\frac{9}{32}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$
$\frac{7}{16}$	$\frac{9}{32}$	$\frac{1}{4}$	$\frac{1}{4}$
$\frac{11}{32}$	$\frac{5}{16}$	$\frac{9}{32}$	$\frac{1}{4}$
$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{1}{4}$
$\frac{7}{16}$	$\frac{3}{8}$	$\frac{11}{32}$	$\frac{9}{32}$
$\frac{1}{2}$	$\frac{1}{2}$	$\frac{3}{8}$	$\frac{3}{8}$
$\frac{9}{16}$	$\frac{1}{2}$	$\frac{7}{16}$	$\frac{7}{16}$
$\frac{5}{8}$	$\frac{1}{2}$	$\frac{7}{16}$	$\frac{7}{16}$
$\frac{3}{4}$	$\frac{9}{16}$	$\frac{1}{2}$	$\frac{7}{16}$
$\frac{15}{16}$	$\frac{15}{16}$	$\frac{3}{4}$	$\frac{7}{16}$
$\frac{1}{2}$	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{1}{2}$
$\frac{25}{32}$	$\frac{11}{16}$	$\frac{9}{16}$	$\frac{1}{2}$
$\frac{11}{16}$	$\frac{11}{16}$	$\frac{9}{16}$	$\frac{1}{2}$
$\frac{7}{8}$	$\frac{7}{8}$	$\frac{11}{16}$	$\frac{9}{16}$
$\frac{15}{16}$	$\frac{15}{16}$	$\frac{3}{4}$	$\frac{9}{16}$
1	1	$\frac{15}{16}$	$\frac{3}{4}$
$\frac{13}{16}$	$\frac{13}{16}$	$\frac{7}{8}$	$\frac{15}{16}$
$\frac{11}{8}$	1	$\frac{7}{8}$	$\frac{3}{4}$
$\frac{13}{16}$	$\frac{13}{16}$	$\frac{15}{16}$	$\frac{25}{32}$
$\frac{11}{4}$	$\frac{11}{4}$	1	$\frac{13}{16}$
$\frac{15}{16}$	$\frac{15}{16}$	$\frac{15}{16}$	$\frac{7}{8}$

§ 178.169-14 Assembly.

(a) By nailing; screws, hinges and hasp, or other device of equal efficiency are authorized; nails should be driven flush.

§ 178.169-15 Nails and nailing.

(a) Cement coated nails of size and with spacing detailed in §§ 178.169-16 and 178.169-17.

(b) At cleated edges drive at least 49 percent of nails into cleats.

(c) Nails fastening cleats to be staggered and clinch $\frac{1}{8}$ "; uncoated nails authorized.

(d) Nailing tops and bottoms to sides permitted but not required.

§ 178.169-16 Nails; kind and dimensions.

(a) Cement¹ coated of gauge and length as for "sinkers" and "coolers" as generally known to the trade; size² in "penny" as follows:

¹ Uncoated nails authorized when increased 25 percent in number.

² Nails 1-penny smaller authorized when spaced as for 2-penny smaller. Nails 2-penny smaller authorized, but not less than 3-penny, when thickness of material nailed through does not exceed $\frac{1}{2}$ of thickness of material holding points of nails.

Species of wood holding points of nails	Thickness of material holding points of nails (inches)										
	$\frac{3}{8}$ or less	$\frac{7}{16}$	$\frac{1}{2}$	$\frac{9}{16}$	$\frac{5}{8}$	$\frac{11}{16}$	$\frac{3}{4}$	$\frac{25}{32}$	$\frac{13}{16}$	$\frac{7}{8}$	$\frac{15}{16}$ or more
Group 1.....	4	5	5	6	7	7	8	8	8	9	10
Group 2.....	4	4	5	5	6	6	7	7	7	8	9
Group 3.....	3	4	4	5	5	6	6	7	7	7	8
Group 4.....	3	3	4	4	4	5	5	6	6	7	7

§ 178.169-17 Nail spacing.¹

(a) Nail spacing as follows:

Nails (size)	Maximum spacing when driven into end and cleats	
	Side grain	End grains
	Inches	Inches
Threepenny.....	1 $\frac{1}{4}$	1
Fourpenny.....	1 $\frac{1}{2}$	1 $\frac{1}{4}$
Fivepenny.....	1 $\frac{3}{4}$	1 $\frac{1}{2}$
Sixpenny.....	2	1 $\frac{3}{4}$
Sevenpenny.....	2 $\frac{1}{4}$	2
Eightpenny.....	2 $\frac{1}{2}$	2 $\frac{1}{4}$
Ninepenny.....	2 $\frac{3}{4}$	2 $\frac{1}{2}$
Tenpenny.....	3	2 $\frac{3}{4}$

§ 178.169-18 Marking.

(a) Marking on each box with letters and figures at least $\frac{1}{2}$ " high in rectangle as follows:

DOT-15B***

(1) The stars must be replaced by authorized gross weight (for example, DOT-15B125, etc.).

(b) The words "ONE STRAP", or "TWO STRAPS", etc., when straps are required (see § 178.169-13(d)); this to be placed above or below the rectangle.

(c) Marks may also be applied as follows:

DOT-15B

NO STRAP XXX LBS.
ONE STRAP XXX LBS.
TWO STRAPS XXX LBS.

(1) The "X's" must be replaced by authorized gross weights as authorized for the strapping conditions.

(d) Each box must also be marked with the name or symbol of person making the other marks specified in this section. Symbol, if used, must be registered with the Bureau of Explosives.

§ 178.169-19 Closing for shipment.

(a) Box to be securely closed. Nails, if used, to be as prescribed in §§ 178.169-16 and 178.169-17.

¹ To determine number of nails, divide length of nailing edge by spacing; fractions greater than $\frac{1}{2}$ are considered as whole numbers.

(b) Metal straps, as specified by marks on box, must encircle sides, top, and bottom as follows:

(1) One nailless strap: At center of box.

(2) Two or more nailless straps: Outer two about $\frac{1}{6}$ of box length from ends and other equally spaced between.

(3) Nailed straps: At ends of sides, top, and bottom; use same size nails as for closing and space not over twice as far apart.

(4) Size of flat straps must be as follows:

Authorized gross weight (pounds)	Cross-section size when number of straps is—		
	1	2	3
	Inch	Inch	Inch
50.....	$\frac{1}{2}$ x 0.020	$\frac{3}{4}$ x 0.015	.....
100.....	$\frac{5}{8}$ x 0.020	$\frac{1}{2}$ x 0.018	.....
200.....	$\frac{3}{4}$ x 0.023	$\frac{5}{8}$ x 0.020	$\frac{1}{2}$ x 0.018
300.....	.....	$\frac{5}{8}$ x 0.023	$\frac{1}{2}$ x 0.020
400.....	.....	$\frac{3}{4}$ x 0.020	$\frac{1}{2}$ x 0.023
500.....	.....	$\frac{3}{4}$ x 0.023	$\frac{5}{8}$ x 0.023

(5) Wires, Washburn and Moen gauge, authorized as follows:

Authorized gross weight (pounds)	Gauge of wires when number of straps is—		
	1	2	3
50.....	12	14	.....
100.....	11	12	.....
200.....	9	11	11
300.....	.....	10	10
400.....	.....	10	12
500.....	.....	9	11

§ 178.170 Specification 15C; wooden boxes, nailed.

§ 178.170-1 Compliance.

(a) Required in all details.

§ 178.170-2 Closed ² box.

(a) Parts and pieces to be in close contact.

§ 178.170-3 Ends.

(a) One-piece, or equivalent (see § 178.170-4); or cleated as prescribed.

§ 178.170-4 One-piece equivalents.

(a) Parts are considered equivalent to one-piece as follows:

(1) Parts Linderman-joint glued.

² Openings for filling device of inside container authorized if device is properly protected.

(2) Parts at least $\frac{1}{2}$ " thick, tongued and grooved and glued, with 2 or more corrugated fasteners on each joint.

(3) Parts at least $\frac{1}{2}$ " thick fastened with 3 or more corrugated fasteners on each joint.

(4) Parts butt-joint glued, providing the joined surfaces are planed before gluing, so as to assure full contact. After immersion in water for 24 hours at 70° F. the part must not fail at the joint when it is broken.

(b) Corrugated fasteners (as prescribed for one-piece equivalents): 1" wide; penetration $\frac{1}{4}$ thickness of part; within 3" of end of joint and not over 8" apart; for 3 or more, drive alternately into opposite sides of part.

§ 178.170-5 Gluing efficiency.

(a) Shall be determined for boxes for gross weight of 150 pounds or less. When filled with sand and sawdust to marked gross weight, the boxes must be able to withstand 8 drops of 12", one on each corner, onto solid concrete without exposure of contents.

§ 178.170-6 Lumber.

(a) To be well seasoned, commercially dry, and free from decay, loose knots that would interfere with nailing, and other defects that would materially lessen the strength. Grain of wood in cleats must not cross cleat within $\frac{1}{2}$ its length.

§ 178.170-7 Nails.

(a) Cement coated, unless otherwise authorized herein, of size specified for "sinkers" and "coolers" as generally known to the trade.

§ 178.170-8 Grouping of principal woods.

(a) Grouping as follows:

GROUP 1

White pine	Willow.
Norway pine.	Noble fir.
Aspen (popple)	Magnolia.
Spruce.	Buckeye.
Western (yellow) pine.	White fir.
Cottonwood.	Cedar.
Balsam fir.	Redwood.
Yellow poplar.	Butternut.
Chestnut.	Cucumber.
Sugar pine.	Alpine fir.
Cypress.	Lodgepole pine.
Basswood.	Jack pine.

GROUP 2

Southern yellow pine.	North Carolina pine.
Hemlock.	Douglas fir.
	Larch (tamarack)

GROUP 3

White elm.	Black gum.
Red gum.	Black ash.
Sycamore.	Tupelo.
Pumpkin ash.	Maple—soft or silver.

GROUP 4

Hard maple.	Birch.
Beech.	Rock elm.
Oak.	Hickory.
Hackberry.	White ash.

§ 178.170-9 Width of pieces.

(a) At least $2\frac{1}{2}$ ".

§ 178.170-10 Width of pieces.

(a) Twice the prescribed thickness plus $\frac{3}{4}$ ".

§ 178.170-11 Thickness of lumber.

(a) Nailed boxes not cleated (Style 1): Authorized gross weight not over 100 pounds, see Note 1. Sides as in Table 1; top and bottom as in Table 1A; ends as in Table 5.

(b) Glued-lock-corner boxes (Style 6): Authorized gross weight not over 150 pounds. Sides as in Table 3; top and bottom as in Table 1A; ends as in Table 3A. Or, sides as in Table 2; top and bottom as in Table 1A; ends as in Table 4.

(c) Single-cleated boxes (Style 4 or 5): Authorized gross weight not over 200 pounds, see Note 2. Sides as in Table 1; top and bottom as in Table 1A; ends and cleats as in Table 3A.

(d) Double-cleated boxes (Style 2, $2\frac{1}{2}$, or 3): Authorized gross weight not over 500 pounds, see Note 3. Sides as in Table 1; top and bottom as in Table 1A; end and cleats as in Table 2A. Or, sides as in Table 1; top and bottom as in Table 1A; cleats as in Table 3B; ends not thinner than thickest side or top.

NOTE 1: When group 2 woods are used the gross weight may be increased to 110 pounds.

NOTE 2: When group 2 woods are used the gross weight may be increased to 220 pounds.

NOTE 3: When group 2 woods are used the gross weight may be increased to 550 pounds.

(e) Tables are as follows (dimensions of materials finished or resawed):

TABLE 3

Depth of box (inches)	Not over 8"	Not over 9"	Not over 10"	Not over 12"	Not over 14"	Over 14"
Authorized gross weight (pounds)	Minimum thickness of part					
<i>Inches</i>	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>
15	.92	.42	1 1/8	1 1/8	1 1/8	1 1/8
25	3/8	11/32	11/32	1/16	9/32	1/4
35	7/16	7/16	3/8	11/32	11/32	3/4
45	1 1/2	1 1/2	7/16	7/16	3/4	1 1/4
55	1 1/2	1 1/2	1 1/2	7/16	7/16	1 1/2
65	1 1/2	1 1/2	9/16	1 1/2	7/16	7/16
75	5/8	5/8	1/2	1 1/2	1 1/2	7/16
85	11/16	11/16	5/8	1 1/2	1 1/2	1 1/2
100	3/4	11/16	11/16	5/8	9/16	1 1/2
125	13/16	3/4	3/4	11/16	5/8	3/4
150	15/16	15/16	13/16	3/4	11/16	5/8
175	1	15/16	7/8	1 1/16	3/4	11/16
200	1 1/16	1	15/16	7/8	25/32	11/16
250	1 1/4	1 1/16	1	15/16	7/8	25/32
300	1 1/2	1 1/16	1 1/8	1 1/16	15/16	7/8
350		1 1/16	1 1/4	1 1/8	1	15/16
400				1 1/4	1 1/8	1
500					1 1/4	1 1/8

TABLE 3A

Smallest dimension of end	Not over 8"	Not over 9"	Not over 10"	Not over 12"	Not over 14"	Over 14"
Authorized gross weight (pounds)	Minimum thickness of part					
	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>
15	1 32	1 32	1 32	1 32	1 32	1 32
25	7 16	7 16	7 16	7 16	7 16	7 16
35	7 16	7 16	7 16	7 16	7 16	7 16
45	1 1 16	1 1 16	1 1 16	1 1 16	1 1 16	1 1 16
55	9 16	9 16	9 16	9 16	9 16	9 16
65	9 16	9 16	9 16	9 16	9 16	9 16
75	5 8	5 8	5 8	5 8	5 8	5 8
85	1 1 16	1 1 16	5 8	9 16	1 1 16	1 1 16
100	3 4	1 1 16	1 1 16	5 8	9 16	1 1 16
125	13 16	3 4	3 4	1 1 16	5 8	9 16
150	15 16	13 16	13 16	3 4	1 1 16	1 1 16
175	1	15 16	7 8	13 16	3 4	1 1 16
200	1 1 16	1	15 16	7 8	25 32	1 1 16
250	1 1 8	13 16	1	15 16	1	25 32
300	1 1 16	13 16	1 1 8	1 1 16	15 16	7 8
350		1 1 16	1 1 4	1 1 8	1	15 16
400				1 1 4	1 1 8	1
500					1 1 4	1 1 8

TABLE 3B

Smallest dimension of end	Not over 8"	Not over 9"	Not over 10"	Not over 12"	Not over 14"	Over 14"
Authorized gross weight (pounds)	Minimum thickness of part					
	Inches	Inches	Inches	Inches	Inches	Inches
15	7/16	2/16	7/16	7/16	2/16	2/16
25	7/16	2/16	7/16	7/16	7/16	2/16
35	7/16	2/16	7/16	7/16	7/16	2/16
45	1/2	1/2	7/16	7/16	7/16	7/16
55	9/16	1/2	1/2	7/16	7/16	7/16
65	9/16	9/16	9/16	1/2	7/16	7/16
75	5/8	5/8	9/16	1/2	1/2	7/16
85	11/16	11/16	5/8	9/16	1/2	1/2
100		11/16	11/16	5/8	9/16	1/2
127	12/16	3/4	3/4	11/16	5/8	9/16
150	12/16		13/16	7/8	11/16	11/16
175	1	7/8	7/8	13/16	7/8	11/16
200	11/16	1	12/16	7/8	21/32	11/16
250	1 1/8	1 1/16	1	15/16	7/8	21/32
300	1 1/8	1 1/8	1 1/8	1 1/16	1 1/8	7/8
350		1 1/8	1 1/8	1 1/8	1	1 1/16
400					1 1/8	1
500					1 1/8	1 1/8

TABLE 4

Smallest dimension of end	Not over 8"	Not over 9"	Not over 10"	Not over 12"	Not over 14"	Over 14"
Authorized gross weight (pounds)	Minimum thickness of part					
	<i>Inch</i>	<i>Inch</i>	<i>Inch</i>	<i>Inch</i>	<i>Inch</i>	<i>Inch</i>
15	$\frac{7}{16}$	$\frac{7}{16}$	$\frac{7}{16}$	$\frac{7}{16}$	$\frac{7}{16}$	$\frac{7}{16}$
25	$\frac{7}{16}$	$\frac{7}{16}$	$\frac{7}{16}$	$\frac{7}{16}$	$\frac{7}{16}$	$\frac{7}{16}$
35	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$
45	$\frac{9}{16}$	$\frac{9}{16}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{7}{16}$	$\frac{7}{16}$
55	$\frac{5}{8}$	$\frac{9}{16}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{7}{16}$	$\frac{7}{16}$
65	$\frac{11}{16}$	$\frac{5}{8}$	$\frac{5}{8}$	$\frac{9}{16}$	$\frac{1}{2}$	$\frac{1}{2}$
75	$\frac{3}{4}$	$\frac{11}{16}$	$\frac{5}{8}$	$\frac{5}{8}$	$\frac{9}{16}$	$\frac{1}{2}$
85	$\frac{25}{32}$	$\frac{3}{4}$	$\frac{11}{16}$	$\frac{5}{8}$	$\frac{5}{8}$	$\frac{9}{16}$
100	$\frac{7}{8}$	$\frac{13}{16}$	$\frac{3}{4}$	$\frac{11}{16}$	$\frac{5}{8}$	$\frac{9}{16}$
125	$\frac{15}{16}$	$\frac{7}{8}$	$\frac{13}{16}$	$\frac{11}{16}$	$\frac{13}{16}$	$\frac{5}{8}$
150	1	$\frac{15}{16}$	$\frac{15}{16}$	$\frac{7}{8}$	$\frac{3}{4}$	$\frac{11}{16}$

TABLE 5

Smallest dimension of end	Not over 3"	Not over 9"	Not over 10"	Not over 12"	Not over 14"	Over 14"
Authorized gross weight (pounds)	Minimum thickness of part					
	Inch	Inch	Inch	Inch	Inch	Inch
15	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$
25	$\frac{3}{32}$	$\frac{1}{8}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$
35	$\frac{5}{32}$	$\frac{1}{8}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$
45	$\frac{3}{16}$	$\frac{5}{32}$	$\frac{3}{16}$	$\frac{9}{16}$	$\frac{1}{16}$	$\frac{1}{16}$
55	$\frac{7}{16}$	$\frac{1}{4}$	$\frac{5}{8}$	$\frac{5}{8}$	$\frac{9}{16}$	$\frac{1}{16}$
65	$\frac{13}{16}$	$\frac{1}{2}$	$\frac{13}{16}$	$\frac{5}{8}$	$\frac{5}{8}$	$\frac{9}{16}$
75	$\frac{7}{8}$	$\frac{13}{16}$	$\frac{3}{4}$	$\frac{11}{16}$	$\frac{5}{8}$	$\frac{9}{16}$
85	$\frac{13}{16}$	$\frac{7}{8}$	$\frac{13}{16}$	$\frac{3}{4}$	$\frac{13}{16}$	$\frac{5}{8}$
100	1	$\frac{13}{16}$	$\frac{7}{8}$	$\frac{13}{16}$	$\frac{3}{4}$	$\frac{13}{16}$

§ 178.170-12 Reduced thicknesses.

(a) Reduction in thicknesses is authorized as in paragraphs (a) to (d) of this section except that reduced thicknesses must be not less than:

(1) Sides, top, and bottom: Minimum $\frac{1}{4}$ " for boxes up to 150 pounds authorized gross weight and $\frac{3}{8}$ " above that weight.

(2) Ends or cleats: Minimum $\frac{7}{16}$ ".

(b) Sides of one-piece or equivalent: 12½ percent.

(c) Any part or cleat of Group 3 or 4 wood: 20 percent.

(d) Sides, top, and bottom when to be strapped as per § 178.170-18(b): 20 percent for 1 strap; 35 percent for 2 straps.

CONVERSION TABLE

Specified thickness (inches)	Reduced thickness corresponding to percent reduction		
	12½	20	35
$\frac{9}{32}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$
$\frac{5}{16}$	$\frac{9}{32}$	$\frac{1}{4}$	$\frac{1}{4}$
$\frac{1}{2}$	$\frac{3}{8}$	$\frac{9}{32}$	$\frac{1}{4}$
$\frac{5}{8}$	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{1}{4}$
$\frac{3}{4}$	$\frac{5}{8}$	$\frac{1}{2}$	$\frac{9}{32}$
$\frac{7}{8}$	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{5}{8}$
$\frac{15}{16}$	$\frac{7}{8}$	$\frac{7}{8}$	$\frac{3}{4}$
$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$
$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$
$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$
$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$
$\frac{3}{4}$	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{3}{4}$
$\frac{5}{8}$	$\frac{5}{8}$	$\frac{5}{8}$	$\frac{5}{8}$
$\frac{7}{8}$	$\frac{7}{8}$	$\frac{7}{8}$	$\frac{7}{8}$
$\frac{15}{16}$	$\frac{15}{16}$	$\frac{15}{16}$	$\frac{15}{16}$
1	1	1	1
$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$
$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$
$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$
$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$
$\frac{3}{4}$	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{3}{4}$
$\frac{5}{8}$	$\frac{5}{8}$	$\frac{5}{8}$	$\frac{5}{8}$
$\frac{7}{8}$	$\frac{7}{8}$	$\frac{7}{8}$	$\frac{7}{8}$
$\frac{15}{16}$	$\frac{15}{16}$	$\frac{15}{16}$	$\frac{15}{16}$

§ 178.170-13 Assembly.

(a) By nailing; screws, hinges and hasp, or other device of equal efficiency are authorized; nails should be driven flush.

§ 178.170-14 Nails and nailing.

(a) Cement coated nails of size and with spacing detailed in §§ 178.170-15 and 178.170-16.

(b) At cleated edges drive at least 40 percent of nails into cleats.

(c) Nails fastening cleats to be staggered and clinch $\frac{1}{8}$ "; uncoated nails authorized.

(d) Nailing tops and bottoms to sides permitted but not required.

§ 178.170-15 Nails; kind and dimensions.

(a) Cement¹ coated of gauge and length as for "sinkers" and "coolers" as generally known to the trade; size² in "penny" as follows:

¹ Uncoated nails authorized when increased 25 percent in number.

² Nails 1-penny smaller authorized when spaced as for 2-penny smaller. Nails 2-penny smaller authorized, but not less than 3-penny, when thickness of material nailed through does not exceed $\frac{1}{2}$ of thickness of material holding points of nails.

Species of wood holding points of nails	Thickness of material holding points of nails (Inches)										
	$\frac{3}{8}$ or less	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{3}{4}$	$\frac{7}{8}$	$1\frac{1}{8}$	$\frac{3}{4}$	$2\frac{3}{4}$	$1\frac{3}{4}$	$\frac{7}{8}$	$1\frac{5}{8}$ or more
Group 1.....	4	5	5	6	7	7	8	8	8	9	10
Group 2.....	4	4	5	5	6	6	7	7	7	8	9
Group 3.....	3	4	4	5	5	6	6	7	7	7	8
Group 4.....	3	3	4	4	4	5	5	6	6	7	7

§ 178.170-16 Nail spacing.¹

(a) Nail spacing as follows:

Nails (size)	Maximum spacing when driven into end and cleats	
	Side grain	End grains
	Inches	Inches
Threepenny	11 $\frac{1}{2}$	1
Fourpenny	11 $\frac{1}{2}$	1 $\frac{1}{2}$
Fivepenny	13 $\frac{1}{4}$	1 $\frac{1}{2}$
Sixpenny	2	1 $\frac{1}{2}$
Sevenpenny	2 $\frac{1}{4}$	2
Eightpenny	2 $\frac{1}{2}$	2 $\frac{1}{4}$
Ninepenny	2 $\frac{3}{4}$	2 $\frac{1}{4}$
Tenpenny	3	2 $\frac{1}{2}$

§ 178.170-17 Marking.

(a) Marking on each box with letters and figures at least $\frac{1}{2}$ " high in rectangle as follows:

DOT-15D***

(1) The stars must be replaced by authorized gross weight (for example, DOT-15C100, etc.).

(b) The words "ONE STRAP", or "TWO STRAPS", etc., when straps are required (see § 178.170-12(d)); this to be placed above or below the rectangle.

(c) Marks may also be applied as follows:

DOT-15C

NO STRAP XXX LBS.
ONE STRAP XXX LBS.
TWO STRAPS XXX LBS.

(1) The "X's" must be replaced by authorized gross weights as authorized for the strapping conditions.

(d) Each box must also be marked with the name or symbol of person making the other marks specified in this section. Symbol, if used, must be registered with the Bureau of Explosives.

¹ To determine number of nails, divide length of nailing edge by spacing; fractions greater than $\frac{1}{2}$ are considered as whole numbers.

§ 178.170-18 Closing for shipment.

(a) Box to be securely closed. Nails, if used, to be as prescribed in §§ 178.170-15 and 178.170-16.

(b) Metal straps, as specified by marks on box, must encircle sides, top, and bottom as follows:

(1) One nailless strap: At center of box.

(2) Two or more nailless straps: Outer two about $\frac{1}{6}$ of box length from ends and other equally spaced between.

(3) Nailed straps: At ends of sides, top, and bottom; use same size nails as for closing and space not over twice as far apart.

(4) Size of flat straps must be as follows:

Authorized gross weight (pounds)	Cross-section size when number of straps is—		
	1	2	3
	Inch	Inch	Inch
50	$\frac{1}{2}$ x 0.020	$\frac{3}{8}$ x 0.015	
100	$\frac{1}{2}$ x 0.020	$\frac{1}{2}$ x 0.018	
200	$\frac{3}{4}$ x 0.023	$\frac{1}{2}$ x 0.020	$\frac{1}{2}$ x 0.018
300		$\frac{1}{2}$ x 0.023	$\frac{1}{2}$ x 0.020
400		$\frac{3}{4}$ x 0.020	$\frac{1}{2}$ x 0.023
500		$\frac{3}{4}$ x 0.023	$\frac{3}{4}$ x 0.023

(5) Wires, Washburn and Moen gauge, authorized as follows:

Authorized gross weight (pounds)	Gauge of wires when number of straps is—		
	1	2	3
50	12	14	
100	11	12	
200	9	11	12
300		10	11
400		10	11
500		9	10

§ 178.171 Specification 15D; wooden boxes, nailed.

§ 178.171-1 Compliance.

(a) Required in all details.

§ 178.171-2 Space between boards.

(a) Space 4" wide authorized except that bottom pieces must be in close contact with each other and with sides and ends.

§ 178.171-3 Ends.

(a) One-piece, or equivalent (see § 178.171-5); or cleated as prescribed.

§ 178.171-4 Handles.

(a) Containers may be provided with suitable handles at discretion of shipper. Handles must be of dimensions specified herein, consisting of horizontal strips or cleats extending across top of each side or each end; handles which do not project, 3 inches beyond the vertical edges of the container must be mounted to leave at least $\frac{7}{16}$ inch open space between handle and box, or be at least $\frac{3}{4}$ inch thick, or be of cross section at least equal to cleats required for single-cleated boxes of corresponding size and gross weight. Extension of cleats or side boards is acceptable for projecting handles.

Authorized gross weight, maximum (pounds):	Handles, minimum cross section (inches)
100-----	$\frac{1}{2}$ x $1\frac{3}{4}$
150-----	$\frac{1}{2}$ x $2\frac{3}{4}$
200-----	$\frac{5}{8}$ x $2\frac{1}{2}$
300-----	$\frac{5}{8}$ x $3\frac{1}{2}$
400-----	$\frac{7}{8}$ x $3\frac{1}{2}$

§ 178.171-5 One-piece equivalents.

(a) Parts are considered equivalent to one-piece as follows:

- (1) Parts Linderman-joint glued.
- (2) Parts at least $\frac{1}{2}$ " thick, tongued and grooved and glued, with 2 or more corrugated fasteners on each joint.
- (3) Parts at least $\frac{1}{2}$ " thick fastened with 3 or more corrugated fasteners on each joint.
- (4) Parts butt-joint glued, provided the joined surfaces are planed before gluing, so as to assure full contact. After immersion in water for 24 hours at 70° F. the part must not fail at the joint when it is broken.

(b) Corrugated fasteners (as prescribed for one-piece equivalents). 1" wide; penetration $\frac{1}{8}$ thickness of part; within 3" of end of joint and not over 8" apart; for 3 or more, drive alternately into opposite sides of part.

§ 178.171-6 Gluing efficiency.

(a) Shall be determined for boxes for gross weight of 150 pounds or less. When filled with sand and sawdust to marked gross weight, the boxes must be able to withstand 8 drops of 12", one on each corner, onto solid concrete without exposure of contents.

§ 178.171-7 Lumber.

(a) To be well seasoned, commercially dry, and free from decay, loose knots, knots that would interfere with nailing, and other defects that would materially

lessen the strength. Grain of wood in cleats must not cross cleat within $\frac{1}{2}$ its length.

§ 178.171-8 Nails.

(a) Cement coated, unless otherwise authorized herein, of size specified for "sinkers" and "coolers" as generally known to the trade.

§ 178.171-9 Grouping of principal woods.

(a) Grouping as follows:

GROUP 1

White pine.	Yellow poplar.
Norway pine.	Chestnut.
Aspen (popple).	Sugar pine.
Spruce.	Cypress.
Western (yellow) pine.	Basswood.
Cottonwood.	Willow.
Balsam fir.	Noble fir.
Buckeye.	Magnolia.
White fir.	Cucumber.
Cedar.	Alpine fir.
Redwood.	Lodgepole pine.
Butternut.	Jack pine.

GROUP 2

Southern yellow pine.	Douglas fir.
Hemlock.	Larch (tamarack)
North Carolina pine.	

GROUP 3

White elm.	Black gum.
Red gum.	Black ash.
Sycamore.	Tupelo.
Pumpkin ash.	Maple—soft or silver.

GROUP 4

Hard maple.	Birch.
Beech.	Rock elm.
Oak.	Hickory.
Hackberry.	White ash.

§ 178.171-10 Width of pieces.

(a) At least $2\frac{1}{2}$ ".

§ 178.171-11 Width of cleats.

(a) Twice the prescribed thickness plus $\frac{3}{4}$ ".

§ 178.171-12 Thickness of lumber.

(a) Nailed boxes not cleated (Style 1): Authorized gross weight not over 100 pounds, see Note 1. Sides as in Table 1; top and bottom as in Table 1A; ends as in Table 5.

(b) Glued-lock-corner boxes (Style 6): Authorized gross weight not over 150 pounds. Sides as in Table 3; top and bottom as in Table 1A; ends as in Table 3A. Or, sides as in Table 2; top and bottom as in Table 1A; ends as in Table 4.

(c) Single-cleated boxes (Style 4 or 5): Authorized gross weight not over 200 pounds for boxes with vertical cleats nor over 400 pounds for boxes with horizontal cleats. Sides as in Table 1; top and bottom as in Table 1A; ends and cleats as in Table 3A.

(d) Double-cleated boxes (Style 2, 2½, or 3): Authorized gross weight not over 500 pounds. Sides as in Table 1; top and bottom as in Table 1A; ends and cleats as in Table 2A. Or, sides as in Table 1; top and bottom as in Table 1A, cleats as in Table 3B; ends not thinner than thinnest side or top.

Exception: For containers consisting of an inner wooden crate of at least ½" thickness throughout, with or without top, and an outside double cleated box without the openings permitted by § 178.171-2, the thickness of all parts of the outside box may be reduced to not less than ¼".

(e) Tables are as follows (dimensions of materials finished or resawed):

TABLE 1

Depth of box (inches)	Not over 8"	Not over 9"	Not over 10"	Not over 12"	Not over 14"	Over 14"
Authorized gross weight (pounds)	Minimum thickness of part					
	<i>Inches</i>	<i>Inches</i>	<i>Inch</i>	<i>Inch</i>	<i>Inch</i>	<i>Inch</i>
15	5/16	5/16	5/16	5/16	5/16	5/16
25	5/16	5/16	5/16	5/16	5/16	5/16
35	5/16	5/16	5/16	5/16	5/16	5/16
45	11/32	11/32	11/32	11/32	11/32	11/32
55	3/8	11/32	11/32	11/32	11/32	11/32
65	3/8	3/8	11/32	11/32	11/32	11/32
75	7/16	3/8	3/8	11/32	11/32	11/32
85	7/16	7/16	3/8	3/8	11/32	11/32
100	1/2	7/16	7/16	3/8	3/8	11/32
125	9/16	1/2	1/2	7/16	3/8	3/8
150	5/8	9/16	9/16	1/2	7/16	3/8
175	5/8	5/8	9/16	1/2	1/2	7/16
200	11/16	5/8	5/8	9/16	1/2	7/16
250	25/32	3/4	11/16	5/8	9/16	1/2
300	13/16	13/16	3/4	11/16	5/8	9/16
350	15/16	7/8	13/16	3/4	11/16	5/8
400	1	15/16	7/8	13/16	3/4	11/16
500	1 1/8	1 1/16	1	15/16	7/8	3/4

TABLE 1A

Width of box (inches)	Not over 8"	Not over 9"	Not over 10"	Not over 12"	Not over 14"	Over 14"
Authorized gross weight (pounds)	Minimum thickness of part					
	<i>Inches</i>	<i>Inches</i>	<i>Inch</i>	<i>Inch</i>	<i>Inch</i>	<i>Inch</i>
15	5/16	5/16	5/16	5/16	5/16	5/16
25	5/16	5/16	5/16	5/16	5/16	5/16
35	5/16	5/16	5/16	5/16	5/16	5/16
45	11/32	11/32	11/32	11/32	11/32	11/32
55	3/8	11/32	11/32	11/32	11/32	11/32
65	3/8	3/8	11/32	11/32	11/32	11/32
75	7/16	3/8	3/8	11/32	11/32	11/32
85	7/16	7/16	3/8	3/8	11/32	11/32
100	1/2	7/16	7/16	3/8	3/8	11/32
125	9/16	1/2	1/2	7/16	3/8	3/8
150	5/8	9/16	9/16	1/2	7/16	3/8
175	5/8	5/8	9/16	1/2	1/2	7/16
200	11/16	5/8	5/8	9/16	1/2	7/16
250	25/32	3/4	11/16	5/8	9/16	1/2
300	13/16	13/16	3/4	11/16	5/8	9/16
350	15/16	7/8	13/16	3/4	11/16	5/8
400	1	15/16	7/8	13/16	3/4	11/16
500	1 1/8	1 1/16	1	15/16	7/8	3/4

TABLE 2

Depth of box (inches)	Not over 8"	Not over 9"	Not over 10"	Not over 12"	Not over 14"	Over 14"
Authorized gross weight (pounds)	Minimum thickness of part					
	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>	<i>Inch</i>	<i>Inch</i>
15	11/32	11/32	11/32	11/32	11/32	11/32
25	11/32	11/32	11/32	11/32	11/32	11/32
35	3/8	11/32	11/32	11/32	11/32	11/32
45	7/16	3/8	3/8	11/32	11/32	11/32
55	1/2	7/16	3/8	3/8	11/32	11/32
65	1/2	1/2	7/16	3/8	3/8	11/32
75	9/16	7/16	1/2	7/16	3/8	3/8
85	9/16	9/16	1/2	7/16	7/16	3/8
100	5/8	9/16	9/16	1/2	7/16	7/16
125	11/16	5/8	5/8	9/16	1/2	7/16
150	3/4	11/16	11/16	5/8	9/16	1/2
175	13/16	3/4	11/16	11/16	5/8	9/16
200	7/8	13/16	3/4	3/4	11/16	5/8
250	1	15/16	7/8	13/16	3/4	5/8
300	11/16	1	15/16	7/8	25/32	11/16
350	1 1/8	1 1/16	1	15/16	7/8	3/4
400	1 1/16	1 1/8	1	15/16	15/16	13/16
500	1 1/8	1 1/16	1 1/8	15/16	1	7/8

TABLE 2A

Smallest dimension of end	Not over 8"	Not over 9"	Not over 10"	Not over 12"	Not over 14"	Over 14"
Authorized gross weight (pounds)	Minimum thickness of part					
	Inches	Inches	Inches	Inches	Inch	Inch
15	1 1/32	1 1/32	1 1/32	1 1/32	1 1/4	1 1/32
25	7/16	7/16	7/16	7/16	7/16	7/16
35	7/16	7/16	7/16	7/16	7/16	7/16
45	7/16	7/16	7/16	7/16	7/16	7/16
55	1/2	1/2	1/2	1/2	1/2	1/2
65	1/2	1/2	1/2	1/2	1/2	1/2
75	1/2	1/2	1/2	1/2	1/2	1/2
85	9/16	9/16	1/2	7/16	1/2	1/2
100	5/8	5/8	9/16	5/8	7/16	1/2
125	1 1/16	5/8	5/8	5/8	1/2	1/2
150	3/4	1 1/16	1 1/16	5/8	9/16	7/16
175	1 1/16	3/4	1 1/16	1 1/16	5/8	7/16
200	7/8	1 1/8	3/4	3/4	1 1/16	7/16
250	1	1 5/8	7/8	1 1/8	3/4	5/8
300	1 1/16	1	1 5/8	7/8	25/32	1 1/16
350	1 1/8	1 1/8	1	1 5/16	7/8	3/4
400	1 3/8	1 3/8	1 1/8	1	1 5/16	1 1/16
500			1 3/8	1 1/8	1	7/8

TABLE 3A

Smallest dimension of end	Not over 8"	Not over 9"	Not over 10"	Not over 12"	Not over 14"	Over 14"
Authorized gross weight (pounds)	Minimum thickness of part					
	Inches	Inches	Inches	Inches	Inches	Inches
15	1 1/32	1 1/32	1 1/32	1 1/32	1 1/32	1 1/32
25	7/16	7/16	7/16	7/16	7/16	7/16
35	7/16	7/16	7/16	7/16	7/16	7/16
45	1/2	1/2	1/2	1/2	1/2	1/2
55	1/2	1/2	1/2	1/2	1/2	1/2
65	9/16	9/16	9/16	9/16	9/16	9/16
75	5/8	5/8	5/8	5/8	5/8	5/8
85	1 1/16	1 1/16	1 1/16	1 1/16	1 1/16	1 1/16
100	3/4	3/4	3/4	3/4	3/4	3/4
125	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8
150	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8
175	1	1 1/16	7/8	13/16	3/4	11/16
200	1 1/16	1	15/16	7/8	25/32	1 1/16
250	1 1/8	1 1/8	1	1 1/16	7/8	25/32
300	1 1/4	1 1/4	1 1/4	1 1/16	7/8	7/8
350		1 1/4	1 1/4	1 1/8	1	15/16
400				1 1/4		
500					1 1/4	1 1/8

TABLE 3

Depth of box (inches)	Not over 8"	Not over 9"	Not over 10"	Not over 12"	Not over 14"	Over 14"
Authorized gross weight (pound.)	Minimum thickness of part					
	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>
15	$\frac{3}{16}$	$\frac{3}{16}$	$\frac{3}{16}$	$\frac{3}{16}$	$\frac{3}{16}$	$\frac{3}{16}$
25	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$
35	$\frac{7}{16}$	$\frac{7}{16}$	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$
45	$\frac{1}{2}$	$\frac{7}{8}$	$\frac{7}{8}$	$\frac{7}{8}$	$\frac{3}{4}$	$\frac{1}{2}$
55	$\frac{9}{16}$	$\frac{7}{8}$	$\frac{1}{2}$	$\frac{7}{8}$	$\frac{7}{8}$	$\frac{3}{4}$
65	$\frac{9}{16}$	$\frac{9}{16}$	$\frac{9}{16}$	$\frac{7}{8}$	$\frac{7}{8}$	$\frac{7}{8}$
75	$\frac{5}{8}$	$\frac{5}{8}$	$\frac{7}{8}$	$\frac{7}{8}$	$\frac{7}{8}$	$\frac{7}{8}$
85	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{9}{16}$	$\frac{1}{2}$	$\frac{1}{2}$
100	$\frac{3}{4}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{9}{16}$	$\frac{1}{2}$
125	$\frac{1}{2}$	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{9}{16}$
150	$\frac{1}{2}$	$\frac{3}{4}$	$\frac{1}{2}$	$\frac{3}{4}$	$\frac{1}{2}$	$\frac{5}{8}$
175	1	$\frac{1}{2}$	$\frac{7}{8}$	$\frac{1}{2}$	$\frac{3}{4}$	$\frac{1}{2}$
200	$\frac{1}{2}$	1	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{3}{4}$	$\frac{1}{2}$
250	$\frac{1}{2}$	$\frac{1}{2}$	1	$\frac{1}{2}$	$\frac{3}{4}$	$\frac{1}{2}$
300	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{3}{4}$	$\frac{1}{2}$
350		$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{3}{4}$	$\frac{1}{2}$
400				$\frac{1}{2}$	$\frac{3}{4}$	$\frac{1}{2}$
500					$\frac{1}{2}$	$\frac{1}{2}$

TABLE 3B

Smallest dimension of end	Not over 8"	Not over 9"	Not over 10"	Not over 12"	Not over 14"	Over 14"
Authorized gross weight (pounds)	Minimum thickness of part					
	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>
15	$\frac{3}{16}$	$\frac{7}{16}$	$\frac{7}{16}$	$\frac{7}{16}$	$\frac{7}{16}$	$\frac{7}{16}$
25	$\frac{3}{16}$	$\frac{7}{16}$	$\frac{7}{16}$	$\frac{7}{16}$	$\frac{7}{16}$	$\frac{7}{16}$
35	$\frac{7}{16}$	$\frac{7}{16}$	$\frac{7}{16}$	$\frac{7}{16}$	$\frac{7}{16}$	$\frac{7}{16}$
45	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{7}{16}$	$\frac{7}{16}$	$\frac{7}{16}$	$\frac{7}{16}$
55	$\frac{9}{16}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{7}{16}$	$\frac{7}{16}$	$\frac{7}{16}$
65	$\frac{9}{16}$	$\frac{9}{16}$	$\frac{9}{16}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{7}{16}$
75	$\frac{5}{8}$	$\frac{5}{8}$	$\frac{9}{16}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{7}{16}$
85	$\frac{11}{16}$	$\frac{11}{16}$	$\frac{5}{8}$	$\frac{9}{16}$	$\frac{1}{2}$	$\frac{1}{2}$
100	$\frac{3}{4}$	$\frac{11}{16}$	$\frac{11}{16}$	$\frac{5}{8}$	$\frac{9}{16}$	$\frac{1}{2}$
125	$\frac{13}{16}$	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{11}{16}$	$\frac{5}{8}$	$\frac{9}{16}$
150	$\frac{15}{16}$	$\frac{7}{8}$	$\frac{13}{16}$	$\frac{3}{4}$	$\frac{11}{16}$	$\frac{11}{16}$
175	1	$\frac{15}{16}$	$\frac{7}{8}$	$\frac{13}{16}$	$\frac{3}{4}$	$\frac{11}{16}$
200	$\frac{11}{16}$	1	$\frac{13}{16}$	$\frac{13}{16}$	$\frac{7}{8}$	$\frac{25}{32}$
250	$\frac{11}{16}$	$\frac{13}{16}$	1	$\frac{13}{16}$	$\frac{7}{8}$	$\frac{25}{32}$
300	$\frac{15}{16}$	$\frac{13}{16}$	$\frac{11}{8}$	$\frac{11}{16}$	$\frac{15}{16}$	$\frac{7}{8}$
350		$\frac{15}{16}$	$\frac{13}{16}$	$\frac{11}{8}$	1	$\frac{15}{16}$
400				$\frac{13}{16}$		1
500					$\frac{13}{16}$	$\frac{13}{16}$

TABLE 4

Smallest dimension of end	Not over 8"	Not over 9"	Not over 10"	Not over 12"	Not over 14"	Over 14"
Authorized gross weight (pounds)	Minimum thickness of part					
	Inch	Inch	Inch	Inch	Inch	Inch
15	$\frac{7}{16}$	$\frac{7}{16}$	$\frac{7}{16}$	$\frac{7}{16}$	$\frac{7}{16}$	$\frac{7}{16}$
25	$\frac{7}{16}$	$\frac{7}{16}$	$\frac{7}{16}$	$\frac{7}{16}$	$\frac{7}{16}$	$\frac{7}{16}$
35	$\frac{3}{2}$	$\frac{3}{2}$	$\frac{3}{2}$	$\frac{3}{2}$	$\frac{3}{2}$	$\frac{3}{2}$
45	$\frac{9}{16}$	$\frac{9}{16}$	$\frac{3}{2}$	$\frac{3}{2}$	$\frac{3}{2}$	$\frac{3}{2}$
55	$\frac{3}{4}$	$\frac{9}{16}$	$\frac{3}{2}$	$\frac{3}{2}$	$\frac{3}{2}$	$\frac{3}{2}$
65	$\frac{11}{16}$	$\frac{3}{4}$	$\frac{3}{2}$	$\frac{3}{2}$	$\frac{3}{2}$	$\frac{3}{2}$
75	$\frac{3}{4}$	$\frac{11}{16}$	$\frac{3}{2}$	$\frac{3}{4}$	$\frac{9}{16}$	$\frac{3}{2}$
85	$\frac{2}{3}$	$\frac{3}{4}$	$\frac{11}{16}$	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{3}{2}$
100	$\frac{3}{4}$	$\frac{13}{16}$	$\frac{3}{4}$	$\frac{11}{16}$	$\frac{3}{4}$	$\frac{3}{2}$
125	$\frac{13}{16}$	$\frac{3}{4}$	$\frac{13}{16}$	$\frac{3}{4}$	$\frac{11}{16}$	$\frac{3}{2}$
150	1	$\frac{13}{16}$	$\frac{15}{16}$	$\frac{3}{4}$	$\frac{13}{16}$	$\frac{11}{16}$

TABLE 5

Smallest dimension of end	Not over 8"	Not over 9"	Not over 10"	Not over 12"	Not over 14"	Over 14"
Authorized gross weight (pounds)	Minimum thickness of part					
	Inch	Inch	Inch	Inch	Inch	Inch
15	$\frac{3}{2}$	$\frac{3}{2}$	$\frac{3}{2}$	$\frac{3}{2}$	$\frac{3}{2}$	$\frac{3}{2}$
25	$\frac{3}{2}$	$\frac{3}{2}$	$\frac{3}{2}$	$\frac{3}{2}$	$\frac{3}{2}$	$\frac{3}{2}$
35	$\frac{3}{2}$	$\frac{3}{2}$	$\frac{3}{2}$	$\frac{3}{2}$	$\frac{3}{2}$	$\frac{3}{2}$
45	$\frac{13}{16}$	$\frac{3}{2}$	$\frac{3}{2}$	$\frac{3}{2}$	$\frac{3}{2}$	$\frac{3}{2}$
55	$\frac{3}{4}$	$\frac{13}{16}$	$\frac{3}{2}$	$\frac{3}{2}$	$\frac{3}{2}$	$\frac{3}{2}$
65	$\frac{13}{16}$	$\frac{3}{4}$	$\frac{13}{16}$	$\frac{3}{2}$	$\frac{3}{2}$	$\frac{3}{2}$
75	$\frac{3}{4}$	$\frac{13}{16}$	$\frac{3}{4}$	$\frac{13}{16}$	$\frac{3}{2}$	$\frac{3}{2}$
85	$\frac{13}{16}$	$\frac{3}{4}$	$\frac{13}{16}$	$\frac{3}{4}$	$\frac{13}{16}$	$\frac{3}{2}$
100	1	$\frac{13}{16}$	$\frac{3}{4}$	$\frac{13}{16}$	$\frac{3}{4}$	$\frac{13}{16}$

§ 178.171-13 Reduced thicknesses.

(a) Reduction in thicknesses is authorized as in paragraphs (a) to (d) of this section except that reduced thicknesses must be not less than:

(1) Sides, top, and bottom: Minimum $\frac{5}{16}$ " for boxes up to 35 pounds authorized gross weight and $\frac{3}{8}$ " above that weight.

(2) Ends or cleats: Minimum $\frac{7}{16}$ ".

(b) Sides of one-piece or equivalent: 12½ percent. In battery boxes reinforced with separate pieces in the form of extension handles, not extension of side boards or cleats, having cross section at least equal to cleats required for single-cleated boxes of corresponding size and gross weight, 20 percent in sides of ends so reinforced.

(c) Any part or cleat of Group 3 or 4 wood: 20 percent.

(d) Sides, top, and bottom when to be strapped as per § 178.171-18(b): 20 percent for 1 strap; 35 percent for 2 straps.

CONVERSION TABLE

Specified thickness (inches)	Reduced thickness corresponding to percent reduction		
	12½	20	35
$\frac{9}{32}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$
$\frac{5}{16}$	$\frac{25}{32}$	$\frac{1}{4}$	$\frac{1}{4}$
$\frac{11}{32}$	$\frac{5}{16}$	$\frac{25}{32}$	$\frac{1}{4}$
$\frac{3}{8}$	$\frac{1}{2}$	$\frac{5}{16}$	$\frac{1}{4}$
$\frac{7}{16}$	$\frac{3}{8}$	$\frac{11}{32}$	$\frac{9}{32}$
$\frac{1}{2}$	$\frac{3}{4}$	$\frac{3}{8}$	$\frac{5}{16}$
$\frac{5}{8}$	$\frac{3}{4}$	$\frac{7}{16}$	$\frac{3}{8}$
$\frac{3}{4}$	$\frac{3}{4}$	$\frac{3}{2}$	$\frac{3}{8}$
$\frac{7}{8}$	$\frac{3}{4}$	$\frac{3}{2}$	$\frac{3}{8}$
$\frac{15}{16}$	$\frac{3}{4}$	$\frac{3}{2}$	$\frac{3}{8}$
1	$\frac{3}{4}$	$\frac{3}{2}$	$\frac{3}{8}$
$\frac{13}{16}$	$\frac{13}{16}$	$\frac{3}{2}$	$\frac{13}{16}$
$\frac{1}{2}$	1	$\frac{3}{2}$	$\frac{3}{2}$
$\frac{13}{16}$	$\frac{13}{16}$	$\frac{13}{16}$	$\frac{23}{32}$
$\frac{13}{16}$	$\frac{13}{16}$	1	$\frac{13}{16}$
$\frac{13}{16}$	$\frac{13}{16}$	$\frac{13}{16}$	$\frac{3}{8}$

§ 178.171-14 Nails and nailing.

(a) Cement coated nails of size and with spacing detailed in §§ 178.171-15 and 178.171-16.

(b) At cleated edges drive at least 40 percent of nails into cleats.

(c) Nails fastening cleats to be staggered and clinch $\frac{1}{8}$ "; uncoated nails authorized.

(d) Nailing tops and bottoms to sides permitted but not required.

§ 178.171-15 Nails; kind of dimensions.

(a) Cement¹ coated of gauge and length as for "sinkers" and "coolers" as generally known to the trade; size² in "penny" as follows:

¹ Uncoated nails authorized when increased 25 percent in number.

² Nails 1-penny smaller authorized when spaced as for 2-penny smaller. Nails 2-penny smaller authorized, but not less than 3-penny, when thickness of material nailed through does not exceed $\frac{1}{2}$ of thickness of material holding points of nails.

Species of wood holding points of nails	Thickness of material holding points of nails (inches)										
	$\frac{3}{8}$ or less	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{3}{4}$	$\frac{7}{8}$	$1\frac{1}{8}$	$\frac{1}{2}$	$2\frac{3}{32}$	$1\frac{1}{8}$	$\frac{7}{8}$	$1\frac{1}{2}$ or more
Group 1.....	4	5	5	6	7	7	8	8	8	9	10
Group 2.....	4	4	5	5	6	6	7	7	7	8	9
Group 3.....	3	4	4	5	5	6	6	7	7	7	8
Group 4.....	3	3	4	4	4	5	5	6	6	7	7

§ 178.171-16 Nail spacing.¹

(a) Nail spacing as follows:

Nails (size)	Maximum spacing when driven into end and cleats	
	Side grain	End grains
	Inches	Inches
Threepenny.....	1 $\frac{1}{4}$	1
Fourpenny.....	1 $\frac{1}{2}$	1 $\frac{1}{4}$
Fivepenny.....	1 $\frac{3}{4}$	1 $\frac{1}{2}$
Sixpenny.....	2	1 $\frac{3}{4}$
Sevenpenny.....	2 $\frac{1}{4}$	2
Eightpenny.....	2 $\frac{1}{2}$	2 $\frac{1}{4}$
Ninepenny.....	2 $\frac{3}{4}$	2 $\frac{1}{2}$
Tenpenny.....	3	2 $\frac{3}{4}$

§ 178.171-17 Marking.

(a) Marking on each box with letters and figures at least $\frac{1}{2}$ " high in rectangle as follows:

DOT-15E***

(1) The stars must be replaced by authorized gross weight (for example, DOT-15D125, etc.).

(b) The words "ONE STRAP", or "TWO STRAPS", etc., when straps are required (see § 178.171-13(d)); this to be placed above or below the rectangle.

(c) Marks may also be applied as follows:

DOT-15D

NO STRAP XXX LBS.
ONE STRAP XXX LBS.
TWO STRAPS XXX LBS.

(1) The "X's" must be replaced by authorized gross weights as authorized for the strapping conditions.

(d) Each box must also be marked with the name or symbol of person mak-

¹ To determine number of nails, divide length of nailing edge by spacing; fractions greater than $\frac{1}{2}$ are considered as whole numbers.

ing the other marks specified in this section. Symbol, if used, must be registered with the Bureau of Explosives.

§ 178.171-18 Closing for shipment.

(a) Box to be securely closed. Nails, if used, to be as prescribed in §§ 178.171-15 and 178.171-16.

(b) Metal straps, as specified by marks on box, must encircle sides, top, and bottom as follows:

(1) One nailless strap: At center of box.

(2) Two or more nailless straps: Outer two about $\frac{1}{6}$ of box length from ends and other equally spaced between.

(3) Nailed straps: At ends of sides, top and bottom, use same size nails as for closing and space not over twice as far apart.

(4) Size of flat straps must be as follows:

Authorized gross weight (pounds)	Cross-section size when number of straps is—		
	1	2	3
	Inch	Inch	Inch
50.....	$\frac{1}{4}$ x 0.020	$\frac{3}{8}$ x 0.015	
100.....	$\frac{3}{8}$ x 0.020	$\frac{1}{2}$ x 0.018	
200.....	$\frac{1}{2}$ x 0.023	$\frac{3}{4}$ x 0.020	$\frac{1}{2}$ x 0.018
300.....		$\frac{3}{4}$ x 0.023	$\frac{3}{4}$ x 0.020
400.....		$\frac{3}{4}$ x 0.020	$\frac{1}{2}$ x 0.023
500.....		$\frac{3}{4}$ x 0.023	$\frac{3}{4}$ x 0.023

(5) Wires, Washburn and Moen gauge, authorized as follows:

Authorized gross weight (pounds)	Gauge of wires when number of straps is—		
	1	2	3
50.....	12	14	
100.....	11	12	
200.....	9	11	12
300.....		10	11
400.....		10	11
500.....		9	10

§ 178.171-19 Boxes for shipment of wet electric storage batteries.

(a) Boxes over 500 pounds gross weight are authorized for shipments of wet electric storage batteries when the batteries are contained in a rigid cradle or box, or are securely fastened together so as to form a single unit, and not more than one such cradle box, or unit is packed in the outside container. Skids required: runners to be at least 2 inches by 4 inches commercial thickness, minimum of three, except that two runners are authorized when width of case does not exceed 24 inches; or two runners may be used, minimum of 4 inches by 4 inches commercial thickness, when case does not exceed 36 inches in width. Runners to be beveled at ends to facilitate use of rollers. Bottom boards, minimum of 1 inch commercial thickness, to be nailed across runners; bracing of parts and thickness of lumber to be sufficient to protect contents in transit.

§ 178.172 Specification 15E; wooden boxes, fiberboard lined.

§ 178.172-1 Compliance.

(a) Required in all details.

§ 178.172-2 Closed box.

(a) Parts and pieces to be in close contact

§ 178.172-3 Ends.

(a) Butt-joint glued to fiberboard plywood not authorized.

§ 178.172-4 Sides, top, and bottom.

(a) Butt-joint or plywood glued to fiberboard.

§ 178.172-5 Lumber.

(a) To be well seasoned, commercially dry, and free from decay, loose knots, knots that would interfere with nailing, and other defects that would materially

lessen the strength. Grain of wood in cleats must not cross cleat within $\frac{1}{2}$ its length.

(b) Plywood, if used, shall be free of knots, decay, and other visible defects that interfere with the nailing. Plywood used must be of good commercial box or sheathing grade veneer.

§ 178.172-6 Grouping of principal woods.

(a) Grouping as follows:

GROUP 1

White pine.	Balsam fir.
Norway pine.	Yellow poplar.
Aspen (popple).	Chestnut.
Spruce.	Sugar pine.
Western	Cypress.
(yellow) pine.	Basswood.
Cottonwood.	Willow.
Noble fir.	Butternut.
Magnolia.	Cucumber.
Buckeye.	Alpine fir.
White fir.	Lodgepole pine.
Cedar.	Jack pine.
Redwood.	

GROUP 2

Southern	North Carolina
yellow pine.	pine.
Hemlock.	Douglas fir.
	Larch (tamarack).

GROUP 3

White elm.	Black ash.
Red gum.	Tupelo.
Sycamore.	Maple—soft
Pumpkin ash.	or silver.
Black gum.	

GROUP 4

Hard maple.	Oak.
Beech.	Hackberry.
Birch.	Hickory.
Rock elm.	White ash.

§ 178.172-7 Width of pieces.

(a) At least $2\frac{1}{2}$ inches.

§ 178.172-8 Thickness of wood parts.

(a) Thickness as follows:

Authorized gross weight of box not over (pounds)	Style of box (see Notes 2 and 3)	Minimum thickness (see Note 1) of sides, top and bottom in inches		thickness of ends and cleats in inches		Minimum width of cleats in inches	Size of nails in end (penney)	
		Groups 1 and 2	Groups 3 and 4	Groups 1 and 2	Groups 3 and 4		Groups 1 and 2	Groups 3 and 4
150.	1, 2, $2\frac{1}{2}$, 3 or 4.	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$1\frac{3}{4}$	4	4
250.	$2\frac{1}{2}$, 3 or 4.	$\frac{7}{16}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$1\frac{7}{8}$	5	4
350.	$2\frac{1}{2}$ or 3.	$\frac{1}{4}$	$\frac{3}{16}$	$\frac{1}{4}$	$\frac{1}{4}$	$1\frac{1}{2}$	6	5
450.	$2\frac{1}{2}$ or 3.	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{3}{16}$	$\frac{3}{16}$	$2\frac{1}{2}$	6	5
550.	$2\frac{1}{2}$ or 3.	$\frac{3}{8}$	$\frac{5}{16}$	$\frac{13}{16}$	$\frac{13}{16}$	$2\frac{1}{2}$	7	6

NOTE 1: Plywood or paper covered wood veneer board of equal thickness and efficiency is permitted. Paper covered veneer board shall be of good quality Douglas fir core of at least $\frac{3}{16}$ inch thickness, or lumber of equal quality, and free of breaks, gaps, holes, or knots. Paper covering shall be at least Kraft untreated linerboard having a basis weight of 42 pounds per 1,000 square feet and shall be secured to veneer core by adhesive in such manner as to form a satisfactorily laminated board.

NOTE 2: Thickness of ends in style 1 boxes shall be not less than $\frac{25}{32}$ inch and load limit shall be not more than 100 pounds.

NOTE 3: Style 4 boxes have load limit of 200 pounds.

§ 178.172-9 Assembly.

(a) By nails, screws, staples or other devices of equal efficiency. Nails, screws and staples must be driven flush.

§ 178.172-10 Nails and nailing.

(a) Cement coated nails of size and with spacing detailed in §§ 178.172-8 178.172-11 and 178.172-12.

(b) At cleated edges drive at least 40 percent of nails into cleats.

(c) Nails fastening cleats to ends be staggered and clinch $\frac{1}{8}$ inch; uncoated nails authorized.

§ 178.172-11 Nails; kind and dimensions.

(a) Cement¹ coated of gauge and length as for "sinkers" and "coolers" as generally known to the trade; size in penny as prescribed in § 178.172-8.

§ 178.172-12 Nail spacing.³

(a) Nail spacing as follows:

Nails (size)	Maximum spacing when driven into end and cleats	
	Side grain	End grains
	Inches	Inches
Fourpenny.....	1½	1¼
Fivepenny.....	1¾	1½
Sixpenny.....	2	1¾
Sevenpenny.....	2¼	2

¹ Uncoated nails authorized when increased 25 percent in number.

³ To determine number of nails, divide length of nailing edge by spacing; fractions greater than $\frac{1}{2}$ are considered as whole numbers. Each piece of sides, top and bottom shall be nailed to the ends with at least two nails through each end of the piece.

§ 178.172-13 Classification of board.

(a) Fiberboard is hereby classified by strength¹ of completed board as in first column of the following table; weights specified in the table are the minimum authorized:

Authorized gross weight of box not over (pounds)	Classified strength ¹ of completed board	Solid fiberboard minimum combined weight of component plies exclusive of adhesives (pounds per 1,000 sq. ft.)	Facings for corrugated fiberboard double-faced minimum combined weight of facings (pounds per 1,000 sq. ft.)
150	200	190	84
250	275	237	138
350	325	237	138
450	350	283	180
550	375	283	180

¹ Mullen or Cady test (minimum).

§ 178.172-14 Solid fiberboard.

(a) To be 3-ply or more; both outer plies water resistant.

§ 178.172-15 Corrugated fiberboard.

(a) Both outer facings water resistant; corrugated sheets must be at least 0.009 inch thick and weigh not less than 26 pounds per 1,000 square feet; all parts must be securely glued together throughout all contact areas.

§ 178.172-16 Test.

(a) Acceptable board must have prescribed strength. Mullen or Cady test after exposure for at least 3 hours to normal atmospheric conditions (50 to 70 percent relative humidity), under test as follows:

(1) Clamp board firmly in machine and turn wheel thereof at constant speed of approximately 2 revolutions per second.

(2) Six punctures required, 3 from each side; all results but one must show prescribed strength.

(3) Board failing may be retested by making 24 punctures, 12 from each side; when all results but 4 show prescribed strength the board is acceptable.

(4) For corrugated fiberboard, double-pop tests may be disregarded.

§ 178.172-17 Assembly.

(a) The sheet of fiberboard to which are glued the boards forming the sides

¹ Mullen or Cady test (minimum).

top and bottom box sections, shall be properly scored to form a tube. The joint shall be on a side, top or bottom near the center of the face, and located under one of the wood boards of the face.

(1) A water resistant glue shall be used to attach the fiberboard to the wood. The glue shall be applied in ribbons (lines) at right angles to the scores of the tube. The ribbons of glue shall be not less than $1\frac{1}{4}$ " wide and shall be spaced sufficiently close so that glue will cover not less than 25 percent of the surface of the fiberboard. The ribbons of glue shall be equally spaced on the length of the box with the outside ribbons flush with the ends of the tube. Glue shall be applied to the fiberboard on the ends of the box in like amount as on the tube.

(2) For styles 2, $2\frac{1}{2}$, and 3, all faces of the tube shall extend over the end boards and cleats. For style 4, all faces shall extend over the end boards, but only the side sections shall extend over the cleats.

(3) The boards between score lines shall butt against each other when placed on the fiberboard, and the combined widths of the boards shall be approximately equal to the inside dimension of the respective box section so that the boards completely cover the fiberboard between the inside edges of adjacent scores.

(4) A sheet of fiberboard shall be attached to each end as provided in subparagraph (1) of this paragraph and shall completely cover the inside of the end.

§ 178.172-18 Closing for shipment.

(a) Box shall be securely closed. Nails, if used, shall be as prescribed in §§ 178.172-8, 178.172-10, 178.172-11, and 178.172-2.

§ 178.172-19 Marking.

(a) Marking on each box with letters and figures at least $\frac{1}{2}$ " high in rectangle as follows:

DOT-15E***

(1) The stars must be replaced by authorized gross weight (for example, DOT-15E100, etc.).

(b) Each box must also be marked with the name or symbol of person mak-

ing the mark specified in paragraph (a) of this section. Symbol, if used, must be registered with the Bureau of Explosives.

§ 178.176 Specification 15L; wooden boxes with inside containers for desensitized liquid explosives.

§ 178.176-1 Compliance.

(a) Required in all details.

§ 178.176-2 Size and capacity.

(a) Each outside wooden container shall contain not more than one inside metal container having a capacity not to exceed 10 quarts.

§ 178.176-3 Outside containers.

(a) Wooden boxes cleated as prescribed. Parts must be in close contact and completely enclose inside containers. Lumber must be well seasoned, commercially dry, and free from decay, loose knots, knots that would interfere with assembly, or other defects that materially lessen the strength.

(b) Assembly: Use brass screws throughout. Assemble sides and ends with grain of wood vertical. Fasten bottom securely with edges flush with sides and ends of box. Cleats must extend around entire perimeter of box. Apply top and bottom cleats horizontally. Bottom cleats must be flush with bottom surface of the box. Top cleats must extend above top of box to provide a $\frac{3}{4}$ -inch recess for cover projections (see § 178.176-5). Cover must be flush with outside surface of top cleats and must be cleated on the outside at all edges. Cleats may be mitered but must butt at all corners.

(c) Parts and dimensions as follows:

[Minimum dimensions in inches]			
Thickness, sides, top, bottom, and end	Top cleats	Bottom cleats	Cover cleats
$\frac{3}{4}$	$\frac{5}{8} \times 3\frac{1}{2}$	$\frac{5}{8} \times 2\frac{3}{4}$	$\frac{3}{4} \times 2$

§ 178.176-4 Inside containers.

(a) Inside containers must be as follows:

(1) *Metal containers.* Double seamed, of copper weighing not less than 16

ounces per square foot, or other non-sparking material of equivalent strength. All seams must be closed by welding, brazing, or soldering so as to be tight against leakage. Handles must be fastened to top of container and be of copper weighing not less than 48 ounces per square foot, or other nonsparking material of equivalent strength. Each side of the container must be strengthened vertically by at least three equally spaced indented crimps. Each container must have two pouring spouts in the top securely closed by rubber stoppers.

(2) *Rubber liners.* Each inside metal container must be inserted in a two-piece rubber liner or boot, consisting of a cover and body, into which it must fit snugly and which in turn shall fit snugly the outside wooden container. This liner must be watertight and of such size as to fully protect the inside container. Sides of liner must be at least $\frac{1}{4}$ inch in thickness and bottom at least $\frac{1}{2}$ inch in thickness. Top edge of boot must be flanged to fit the recess provided by the top cleats on the outside wooden container and such flange must be at least $\frac{3}{8}$ inch thick exclusive of any channels or indentations necessary to effect satisfactory closure because of projections on cover. Cover must be not less than $\frac{1}{2}$ inch in thickness including projections for securing rubber stoppers in metal containers, and must have a formed molding around its entire perimeter to match and tightly fit channels or indentations in the body flange.

(b) Tests: Each inside metal and rubber container must be adequately tested and inspected during manufacture to insure against leakage.

§ 178.176-5 Closure.

(a) Top of rubber liner must be firmly fastened to wooden cover of outside container so as to fit securely into $\frac{3}{4}$ -inch recess provided by top cleats on box. Top of liner must have projections on the inside which bear directly on rubber stoppers of metal containers to secure them in place. When closure is effected the liner must provide a positive seal against interior leakage. Cover of wooden outside container must be securely fastened to body of container by means of trunk clasps affixed to each face of the box. The trunk clasps must be recessed into cover and top cleats to furnish a smooth bearing surface on all faces of the box.

§ 178.176-6 Marking.

(a) Marking on each box with letters and figures at least $\frac{1}{2}$ -inch high in rectangle as follows:

DOT-15L

(b) Each box must also be marked with the name or symbol of person making the mark specified in paragraph (a) of this section. Symbol, if used, must be registered with the Bureau of Explosives.

§ 178.177 Specification 15M; wooden boxes, metal lined, with inside containers for desensitized liquid explosives.

§ 178.177-1 Compliance.

(a) Required in all details.

§ 178.177-2 Size and capacity.

(a) Each outside wooden container shall contain not more than 6 inside metal containers having nominal capacity of 10 quarts each.

§ 178.177-3 Outside containers.

(a) Wooden boxes cleated as prescribed. Parts must be in close contact and completely enclose inside containers. Lumber must be well seasoned, commercially dry, and free from decay, loose knots, knots that would interfere with assembly, or other defects that materially lessen the strength.

(1) The box shall be lined with copper or other nonsparking metal having suitable strength. All seams must be soldered, welded, or brazed to produce a liquid-tight container having no openings in the bottom, sides, or ends.

(b) Assembly: Use brass screws throughout, countersunk and with heads covered with suitable wood filling compound. Any screw used to secure a metal attachment shall be soldered, welded, or brazed thereto. Metal parts used in the construction of or attached to the box or cover must be of nonsparking type. Fasten bottom securely with edges flush with sides and ends of box. Cleats must extend around entire perimeter of box. Apply top and bottom cleats horizontally. Bottom cleats must be flush with bottom surface of the box. Top cleats must extend above top of box to provide a $\frac{3}{4}$ -inch recess for cover projections

(§ 178.177-5). Cover must be flush with outside surface of top cleats. Cleats may be mitered but must butt at all corners.

(c) Cellular construction: The interior of the box shall be divided into cells by means of removable, nonmetallic, non-sparking dividers, into which the rubber boots or secondary containers fit snugly. The cells shall be of such size as to extend from the bottom to near the top of the rubber boots or secondary containers.

(d) Parts and dimensions as follows:

Minimum dimensions in inches			
Thickness, sides, top, bottom and end	Top cleats	Bottom cleats	Cover cleats
3/4	3/4 x 3 1/2	3/4 x 2 3/4	3/4 x 2

§ 178.177-4 Inside containers.

(a) Inside containers must be as follows:

(1) *Metal containers.* The individual inside containers shall be made in a workmanship manner, of copper or other nonsparking material of suitable strength, with all seams soldered, welded, or brazed to be liquid tight. The top shall be fitted with a securely attached carrying handle of copper or other non-sparking material of suitable strength. Each inside container must have a filling and pouring spout in the top, which shall be securely closed with rubber stoppers, paraffin, or oil-treated corks or other nonmetallic, nonsparking closures which are resistant to absorption of the contents and which provide a leakproof seal. The closures shall be secured in such manner as to prevent loosening, displacement, and leakage of contents during transit. Each inside container may have sufficient capacity in excess of 10 quarts to provide for outage requirements. Each side of the container must be strengthened vertically by at least 3 equally spaced indented crimps.

(2) *Rubber boots or secondary containers.* Each inside metal container must be contained in a rubber boot or other similar suitable leakproof, non-metallic, nonabsorbent outer container, which must fit snugly in cellular structure provided in § 178.177-3(c). The rubber boot or secondary container must

be liquid tight and shall be so constructed as to have an inside height approximately that of the inside metal container plus closure and otherwise so constructed that the bottom will provide cushioning for the inner container.

(b) Tests: Each inside metal and rubber or secondary container must be adequately tested and inspected during manufacture to insure against leakage.

§ 178.177-5 Closure.

(a) The box cover must be securely fastened to the box in a manner to prevent movement of the insider containers. The inner surface of the box cover must be lined with suitable coating material or sheathed with nonsparking metal to provide a nonabsorbent surface. The cover must be secured to the box by means of nylon, or other suitable straps and be so positioned to furnish a smooth bearing surface on all faces of the box. There shall be no protruding parts on the box or cover which would result in metal-to-metal contact.

§ 178.177-6 Marking.

(a) Marking on each box with letters and figures at least 1/2 inch high in rectangle as follows:

DOT-15M

(b) Each box must also be marked with the name or symbol of person making the mark specified in paragraph (a) of this section. Symbol, if used, must be registered with the Bureau of Explosives.

§ 178.181 Specification 15X: wooden boxes for two five-gallon cans.

§ 178.181-1 Compliance.

(a) Required in all details.

§ 178.181-2 Closed box.

(a) Parts and pieces to be in close contact.

§ 178.181-3 Ends.

(a) To be of group 1, 2, or 3 wood not over 2-piece.

§ 178.181-4 Sides, top and bottom.

(a) To be of Group 1, 2, or 3 wood not over 3-piece.

§ 178.181-5 Two-piece ends and corrugated fasteners.

(a) *Two-piece ends.* Joints must be fastened with at least 3 corrugated fasteners.

(b) *Corrugated fasteners.* To be 1" wide and with penetration of $\frac{1}{2}$ inch.

§ 178.181-6 Lumber.

(a) To be well seasoned, commercially dry, and free from decay, loose knots, knots that would interfere with nailing, and other defects that would materially lessen the strength.

§ 178.181-7 Groupings of principal woods.

(a) Grouping as follows:

GROUP 1

White pine.	Willow.
Norway pine.	Noble fir.
Aspen (popple).	Magnolia.
Spruce.	Buckeye.
Western (yellow) pine.	White fir.
Cottonwood.	Cedar.
Balsam fir.	Redwood.
Yellow poplar.	Butternut.
Chestnut.	Cucumber.
Sugar pine.	Alpine fir.
Cypress.	Lodgepole pine.
Basswood.	Jackpine.

GROUP 2

Southern yellow pine.	North Carolina pine.
Larch (tamarack).	Douglas fir.
Hemlock.	

GROUP 3

White elm.	Black ash.
Red gum.	Tupelo.
Sycamore.	Maple, soft or silver.
Pumpkin ash.	
Black gum.	

§ 178.181-8 Width of pieces.

(a) At least 2" for sides, top and bottom if in two pieces, or $2\frac{3}{8}$ " for tops and bottoms and at least 4" for sides if in three pieces.

§ 178.181-9 Thickness of lumber.

(a) Thickness as follows:

(1) Ends: Thickness to be not less than $\frac{3}{4}$ " for Group 1 or 2 lumber and $1\frac{1}{16}$ " for Group 3 lumber.

(2) Sides, top and bottom: Thickness to be not less than $\frac{3}{8}$ ".

§ 178.181-10 Assembly.

(a) By nailing with either bright or cement-coated nails, size and spacing as follows:

(1) Top to each end: 5 nails ($1\frac{1}{2}$ " by $12\frac{1}{2}$ gauge).

(2) Bottom to each end: 6 nails ($1\frac{3}{4}$ " by 12 gauge).

(3) Sides to each end: 6 nails ($1\frac{1}{2}$ " by $12\frac{1}{2}$ gauge).

§ 178.181-11 Marking.

(a) Marking on each box in letters and figures at least $\frac{1}{2}$ " high in a rectangle as follows:

DOT-15X

(b) Each box must also be marked with the name or symbol of person making the mark specified in paragraph (a) of this section. Symbol, if used, must be registered with the Bureau of Explosives.

§ 178.181-12 Inside can.

(a) Size: Approximate dimensions $9\frac{3}{8}$ x $9\frac{3}{8}$ x $13\frac{15}{16}$ inches.

(b) Approximate capacity: 1,188 cu. in.

(c) Top: Embossed.

Seams: Crimped and soldered.

Closure: Airtight and leakproof.

Handles: Wire.

(d) Bottom: Embossed.

Seams: Crimped and soldered.

(e) Body: Paneled on 4 sides.

Two seams: Clinched and soldered.

(f) Material: IC (107 lb.) tin or terne-plate.

(g) Average weight: 2 pounds 8 ounces.

(h) Marking: No specification marking required.

§ 178.182 Specification 15P; glued plywood, or wooden box for inside containers.

§ 178.182-1 Material requirements.

(a) Lumber or plywood must be well seasoned, commercially dry, and free from decay, loose knots, knots that would interfere with nailing, and other

defects that would materially lessen the strength and in accordance with the following:

(1) Lumber must be of good commercial grade.

(2) Plywood sections shall be firmly glued together with waterproof glue. A section of plywood from any part when immersed in water at room temperature for 48 hours shall show no delamination or separation of plies to qualify glue as waterproof.

§ 178.182-2 Construction requirements.

(a) Box shall be constructed of wood or of plywood not less than three-ply fabrication and shall be constructed so as to completely and snugly enclose body of the inside container, and so formed that inside container cannot permanently change position and be of sufficiently strong wood or plywood to withstand prescribed tests without serious rupture of or damage to box that would cause failure or lead to impending failure of inside container.

NOTE 1: Vertical openings not exceeding $\frac{3}{8}$ inch in width and extending to within 3 inches of top or bottom on two opposite sides of box are permitted.

(b) Specifications for the outside container must be filed with and approved by the Bureau of Explosives.

§ 178.182-3 Tests.

(a) One sample, taken at random and with inner container filled to marked capacity with water and closed as for use, shall be capable of withstanding prescribed tests without leakage. Tests shall be made of each size by each company starting production. The type tests are as follows:

(1) Complete package must be capable of withstanding two drops from a height of 4 feet onto solid concrete, the first drop to be made diagonally so top corner will strike the concrete; the second drop onto a 2 inch by 6 inch timber resting on the concrete with the 6 inch leg vertical, the drop being made with the box in a horizontal position and at right angles to the timber so that impact is near the center of the box side-wall.

(2) Additional tests as required by side container specification.

§ 178.182-4 Marking.

(a) Each outside container must be plainly marked with letters and figures

at least $\frac{3}{4}$ inch high applied by hot branding iron or dark colored printing ink with pressure dies as follows:

(1) DOT-15P.

(2) Name or symbol of person making the mark specified in paragraph (a)(1) of this section and located just above or below that mark. Symbol, if used, must be registered with the Bureau of Explosives.

§ 178.185 Specification 16A; plywood or wooden boxes, wirebound.

§ 178.185-1 Compliance.

(a) Required in all details. Authorized tolerances. Cleats, battens, and handles, minus $\frac{1}{32}$ " ; single thickness veneer, minus 5 percent; resawn boards, $\frac{1}{64}$ " below specified thickness for boards up to $\frac{7}{32}$ " thick and $\frac{1}{32}$ " below specified thickness for boards $\frac{1}{4}$ " or more thick.

§ 178.185-2 Lumber or plywood.

(a) Lumber shall be well seasoned and commercially dry; free from decay, objectionable knots, slanting shakes, sharp cross grain, and other defects that materially lessen the strength. Grain of wood in cleats and battens must not cross piece with its length.

(b) Plywood shall be made from veneer which has been rotary cut, sliced, or sawed. Plywood shall be good commercial box or sheathing grade and shall be moisture-resistant; free from decay, objectionable knots that interfere with nailings, splits, gaps, and other defects that materially lessen the strength.

(1) Moisture-resistant plywood shall be fabricated with either synthetic or protein type glue. Specimens for testing shall be not less than 5 in number measuring 6" x 6", and shall withstand 10 cycles of 4 hours immersion in water at room temperature and drying for 20 hours at a temperature not over 100° F. After 10 cycles, 4 of the 5 samples are to show not more than a sum total of 2-inch delamination on the edges, with depth delamination no greater than $\frac{1}{2}$ inch.

§ 178.185-3 Wires.

(a) Of annealed steel, or other metal of equal strength. Washburn and Moen sizes.

§ 178.185-4 Staples.

(a) Wire size, Washburn and Moen.

§ 178.185-5 Grouping of principal woods.

(a) Grouping as follows:

GROUP 1

White pine.	Yellow poplar.
Norway pine.	Balsam fir.
Aspen (popple).	Chestnut.
Spruce.	Sugar pine.
Western	Cypress.
yellow pine.	Basswood.
Cottonwood.	Noble fir.
Willow.	Butternut.
Magnolia.	Alpine fir.
Buckeye.	Cucumber.
White fir.	Lodgepole pine.
Cedar.	Jack pine.
Redwood.	

GROUP 2

Southern	Douglas fir.
yellow pine.	Larch (tamarack).
Hemlock.	
North Carolina	
pine.	

GROUP 3

White elm.	Black gum.
Red gum.	Tupelo.
Sycamore.	Maple—soft
Pumpkin ash.	or silver.
Black ash.	

GROUP 4

Hard maple.	Birch.
Beech.	Rock elm.
Oak.	White ash.
Hackberry	Hickory.

§ 178.185-6 Closed box.

(a) Parts and pieces with edges in close contact to give completely closed box.

§ 178.185-7 Top, sides, and bottom.

(a) Each cleated at both ends; intermediate rows of cleats authorized.

§ 178.185-8 Cleats.

(a) Ends mitered or with mortise and tenon joints.

(b) Cleats for plywood boxes shall be Group 4 woods.

§ 178.185-9 Ends.

(a) Battened when prescribed. Wired ends authorized provided wires run cross grain and terminate in loops with ends of wire driven through end board and clinched. Grain of wood and outside ply of plywood shall be perpendicular to sides except for wired ends.

(b) As provided by § 173.65(a)(1), Note 1, of this chapter, wooden boxes having inside metal containers which are tightly and securely closed, may be equipped with hand holes in each end which must be not more than one inch by four inches and centered laterally not nearer than $1\frac{3}{8}$ inches from top edge of end of box.

§ 178.185-10 Wires.

(a) One wire over each row of cleats; intermediate wires as prescribed.

§ 178.185-11 Stapling.

(a) Staples for wires over cleats driven through boards into cleats and anchored; others through boards and clinched.

§ 178.185-12 Thickness of boards or plywood (sides, tops, bottoms, and ends).

(a) Thickness as follows except that, for thicknesses prescribed as $\frac{3}{16}$ " or less, resawn boards must be $\frac{1}{16}$ " thicker for each resawn surface:

Group of wood	Minimum thickness of boards (inch)						
	$\frac{3}{8}$ (0.125)	$\frac{1}{2}$ (0.143)	$\frac{5}{8}$ (0.167)	$\frac{3}{4}$ (0.185)	$\frac{7}{8}$ (0.219)	1 (0.250)	$1\frac{1}{8}$ (0.313)
	Authorized gross weight, box and contents, not over (pounds)						
-----	25	35	50	75	100	150	200
-----	35	50	75	100	150	200	315
-----	50	75	100	150	200	315	400
-----	75	100	150	200	315	400	-----

(1) For boxes with 3 or more rows of cleats, boards of the next lower thickness prescribed in the table are acceptable.

(b)

Group of wood	Minimum thickness of plywood (inch): ¹		
	1/8 (0.125)	3/16 (0.1875)	1/4 (0.25)
	Authorized gross weight, box and contents, not over (pounds)		
4....	150	300	400

¹ Minimum tolerance of 5% permitted for specified thickness.**§ 178.185-13 Size of cleats.**

(a) At least $1\frac{3}{16}$ " by $1\frac{3}{16}$ " when thickness required for boards exceeds $1\frac{1}{2}$ "; otherwise at least $\frac{9}{16}$ " by $1\frac{3}{16}$ ".

§ 178.185-14 Binding wires (sides, top, and bottom).

(a) Spacing not over 8".

Exception: When each binding wire is stapled to a row of cleats, 11" spacing is authorized.

(b) Number and size of binding wires as follows:

Number of wires	Minimum gauge of wires, Washburn and Moen				
	16	15	14	13	12
	Authorized gross weight, box and contents (pounds)				
2	35	50	75	100	150
3	50	75	100	150	200
4	75	100	150	200	315
5	100	150	200	315	400
6		200	315	400	
7			400		

§ 178.185-15 Wires for wired ends.

(a) At least 2 wires on each end, size not less than as specified for binding wires in § 178.185-14, and spaced as follows:

Thickness of end (inch)	Maximum spacing	
	Between wires (inch)	Wires to cleats (inch)
0.125	6	4
.143	6	4
.167	6 $\frac{1}{2}$	4
.187	6 $\frac{1}{2}$	4
.219	7	4
.270	7	4
.313	7	4

(b) Ends less than 10 inches deep are authorized with 1 wire provided they are

reinforced by 2 strips (liners), at least $1\frac{1}{4}$ " wide and as thick as ends, securely stapled along edges of the end parallel to the wires.

§ 178.185-16 Staple spacing (approximate) and minimum size.

(a) Staples into cleats 16 gauge, Washburn and Moen, and:

(1) One and one-fourth inches long with $1\frac{1}{2}$ -inch spacing, or $1\frac{1}{8}$ inches long with 1-inch spacing, when boards are over $\frac{1}{4}$ -inch thick.

(2) One and one-eighth inches long with $1\frac{1}{2}$ " spacing, for boards $\frac{1}{4}$ " thick or less; except that staples $\frac{7}{8}$ " long with $1\frac{1}{2}$ " spacing are authorized when boards are $\frac{1}{7}$ " thick or less.

(b) Other staples 18 gauge, Washburn and Moen.

§ 178.185-17 End supporting battens.¹

(a) End supporting battens at least $1\frac{1}{8}$ " wide and same thickness as cleats; fastened securely across ends parallel to side cleats; required so that unsupported distance between cleats, battens, and between cleats and battens will be not greater than as follows.

Thickness of ends (inch):	Maximum spacing (inches)
0.125	10
0.143	11
0.167	12
0.187	13
0.219	14
0.250	15
0.313	16

§ 178.185-18 Side cleat battens and wired end supports.

(a) *Side cleat battens.* At least $1\frac{3}{16}$ " by $1\frac{3}{16}$ "; fastened securely to ends so as to be adjacent to side cleats when box is set up; required, in addition to any other

¹ Not required for wired ends less than 20 inches long.

battens, when authorized gross weight exceeds the following:

Group of wood in cleats	Authorized gross weight, box and contents, over (pounds)
1 -----	100
2 -----	150
3 -----	200
4 -----	200

(b) *Wired and supports.* Wired ends for boxes for authorized gross weight exceeding the foregoing, must be reinforced by 2 strips (liners), at least 1¼" wide and as thick as ends, securely stapled along edges of the end parallel to the wires; side cleat battens not required.

§ 178.185-19 Marking.

(a) Marking on each box with letters and figures at least ½" high in rectangle as follows:

DOT-16A***

(1) Stars must be replaced by maximum authorized gross weight (for example, DOT-16A150, etc.).

(b) The name or symbol of person making the marks specified in paragraph (a) of this section must be located just above, below, or following those marks. Symbol, if used, must be registered with the Bureau of Explosives.

§ 178.185-20 Setting up and closing.

(a) Nail or staple unwired ends to side cleats at intervals not over 2½"; fasten wired ends securely by means of loop fasteners.

(b) Twist ends of binding wires or bend loops to give tight closure.

(c) Nail at least 2 nails through side cleats into each side-cleat batten at not over 4" intervals; nail through top and bottom cleats with one 7-penny nail into each end of end-supporting battens.

§ 178.185-22 Special box authorized only when used in conjunction with inside spec. 2U (§ 178.24 of this chapter) polyethylene 5- and 15-gallon cubical containers.

(a) The boxes shall comply with spec. 16A requirements using the table for a

gross weight of 200 pounds for construction purposes only, except as follows:

(1) The top section of boxes may have a hole not over 4⅛ inches in diameter midway between the cleats, and centered not less than 3⅜ inches from either the back or front edge of boxes.

(2) Five-gallon capacity—ends. Ends may be made from ⅛ inch or thicker veneer and have only one 14-gauge wire across face. One-eighth inch veneer liners, at least 1¼ inches wide, must be stapled across the top and bottom of the ends.

(i) Fifteen-gallon capacity — ends. Ends must be made with same thickness faceboard material as the sides, top, and bottom and must have two liners of the same thickness, at least 3 inches wide, fastened by two rows of staples. Ends may have one 13-gauge wire across face.

(3) Paper overlaid veneer having veneer core of group 3 or 4 wood and completely covered on each side with 42 pound basis weight kraft paper securely adhered thereto by moisture resistant adhesive, is authorized. Total combined thickness of finished board shall be not less than 0.160 inch.

(4) Wire spacing for 5-gallon capacity containers. Binding wires stapled to a row of cleats may be spaced not more than 13 inches apart.

(b) Wirebound wooden or paper overlaid veneer board boxes must be provided with full size double-faced corrugated liners of at least 125-pound test (Mullen or Cady) for bottom and sides. Full area top pad is required for 5-gallon capacity containers and must be a minimum of 200-pound test (Mullen or Cady). Full area top pad is required for the 15-gallon capacity container and must be a minimum of 275-pound test (Mullen or Cady).

(c) Marking required:

(1) Marking on each box with letters and figures at least ½ inch high in rectangle as follows:

DOT-16A-C

(2) The name or symbol of person making the mark specified in paragraph (c) (1) of this section and located just above, below, or following that mark.

Symbol, if used, must be registered with the Bureau of Explosives.

§ 178.186 Specification 16B; wooden boxes, wirebound.

§ 178.186-1 Compliance.

(a) Required in all details. Authorized tolerances: Cleats, battens, and handles, minus $\frac{1}{32}$ "; single thickness veneer, minus 5 percent; resawn boards, $\frac{1}{16}$ " below specified thickness for boards up to $\frac{7}{16}$ " thick and $\frac{1}{32}$ " below specified thickness for boards $\frac{1}{4}$ " or more thick.

§ 178.186-2 Lumber.

(a) Well seasoned and commercially dry; free from decay, objectionable knots, slanting shakes, sharp cross grain, and other defects that materially lessen the strength. Grain of wood in cleats and battens must not cross piece within its length.

§ 178.186-3 Wires.

(a) Of annealed steel, or other metal of equal strength, Washburn and Moen sizes.

§ 178.186-4 Staples.

(a) Wire size, Washburn and Moen.

§ 178.186-5 Grouping of principal woods.

(a) Groupings as follows:

GROUP 1

White pine.	Noble fir.
Norway pine.	Willow.
Aspen (popple).	Magnolia.
Spruce.	Buckeye.
Western yellow pine.	White fir.
Cottonwood.	Cedar.
Yellow poplar.	Redwood.
Balsam fir.	Butternut.
Chestnut.	Alpine fir.
Sugar pine.	Cucumber.
Cypress.	Lodgepole pine.
Basswood.	Jack pine.

GROUP 2

Southern yellow pine.	North Carolina pine.
Hemlock.	Douglas fir.
	Larch (tamarack).

GROUP 3

White elm.	Black gum.
Red gum.	Tupelo.
Sycamore.	Maple—soft
Pumpkin ash.	or silver.
Black ash.	

GROUP 4

Hard maple.	Birch.
Beech.	Rock elm.
Oak.	White ash.
Hackberry.	Hickory.

§ 178.186-6 Closed box.

(a) Parts and pieces with edges in close contact to give completely closed box except that spaces $1\frac{1}{2}$ " are authorized between side boards and between top boards when boards are at least $3\frac{1}{2}$ " wide.

(b) Handles: Containers may be provided with suitable handles at discretion of shipper. When used, they must be securely fastened along tops of sides under wires and project 3 inches or be mounted on end cleats; extensions of side boards acceptable; dimensions as follows:

Authorized gross weight not over (pounds):	Handles ¹ minimum cross section (inches)
150	$\frac{1}{2} \times 2\frac{1}{2}$
200	$\frac{5}{8} \times 2\frac{1}{2}$
315	$\frac{3}{4} \times 3\frac{1}{2}$
400	$1\frac{3}{16} \times 3\frac{1}{2}$

¹ Also ridge reinforcing battens when prescribed.

§ 178.186-7 Top, sides, and bottom.

(a) Each cleated at both ends; intermediate rows of cleats authorized.

§ 178.186-8 Cleats.

(a) Ends mitered or with mortise and tenon joints.

§ 178.186-9 Ends.

(a) Battened when prescribed. Wired ends authorized provided wires run cross grain and terminate in loops with ends of wire driven through end board and clinched. Grain of wood perpendicular to sides except for wired ends. Ridge-top containers, authorized as follows:

(1) Ends must be at least 2 times as thick as prescribed in § 178.186-12.

(2) Unsupported distance as prescribed in § 178.186-17 must not exceed 10" in any case.

(3) Ridge over 30" long must be reinforced on the outside, from end to end, by 2 battens with abutting edges and of cross section as prescribed for handles.

(4) Vertical grain unwired ends are authorized.

§ 178.186-10 Wires.

(a) One wire over each row of cleats; intermediate wires as prescribed.

§ 178.186-11 Stapling.

(a) Staples for wires over cleats driven through boards into cleats and anchored; others through boards and clinched.

§ 178.186-12 Thickness of boards (sides, tops, bottoms, and ends).

(a) Thickness as follows except that, for thicknesses prescribed as $\frac{3}{16}$ " or less, resawn boards must be $\frac{1}{64}$ " thicker for each resawn surface:

Group of wood	Minimum thickness of boards (inch)						
	$\frac{1}{4}$ (0.125)	$\frac{1}{2}$ (0.143)	$\frac{1}{8}$ (0.167)	$\frac{3}{16}$ (0.185)	$\frac{7}{32}$ (0.219)	$\frac{1}{4}$ (0.250)	$\frac{5}{16}$ (0.313)
	Authorized gross weight, box and contents (pounds)						
1.....	25	35	50	75	100	150	200
2.....	35	50	75	100	150	200	315
3.....	50	75	100	150	200	315	400
4.....	75	100	150	200	315	400	

(b) For boxes with 3 or more rows of cleats, boards of the next lower thickness prescribed in the table are acceptable.

§ 178.186-13 Size of cleats.

(a) At least $\frac{13}{16}$ " by $\frac{13}{16}$ " when thickness required for boards exceeds $\frac{1}{4}$ "; otherwise at least $\frac{9}{16}$ " by $\frac{13}{16}$ ".

§ 178.186-14 Binding wires (side, top, and bottom).

(a) Spacing not over 8".

Exception. When each binding wire is stapled to a row of cleats, 11" spacing is authorized.

(b) Number and size of binding wires as follows:

Number of wires	Minimum gauge of wires, Washburn and Moen				
	16	15	14	13	12
	Authorized gross weight, box and contents (pounds)				
2.....	35	50	75	100	150
3.....	50	75	100	150	200
4.....	75	100	150	200	315
5.....	100	150	200	315	400
6.....		200	315	400	
7.....			400		

§ 178.186-15 Wires for wired ends.

(a) At least 2 wires on each end, size not less than as specified for binding

wires in § 178.186-14, and spaced as follows:

Thickness of end (inch)	Maximum spacing	
	Between wires (inch)	Wires to cleats (inch)
0.125	6	4
.143	6	4
.167	6½	4
.187	6½	4
.219	7	4
.250	7	4
.313	7	4

(b) Ends less than 10 inches deep are authorized with 1 wire provided they are reinforced by 2 strips (liners), at least $1\frac{1}{4}$ " wire and as thick as ends, securely stapled along edges of the end parallel to the wires.

§ 178.186-16 Staple spacing (approximate) and minimum size.

(a) Staples into cleats 16 gauge, Washburn and Moen, and:

(1) One and one-fourth inches long with $1\frac{1}{2}$ " spacing, or $1\frac{1}{8}$ " long with 1" spacing, when boards are over $\frac{1}{4}$ " thick.

(2) One and one-eighth inches long with $1\frac{1}{2}$ " spacing, for boards $\frac{1}{4}$ " thick or less; except that staples $\frac{7}{8}$ " long with $1\frac{1}{2}$ " spacing are authorized when boards are $\frac{1}{4}$ " thick or less.

(b) Other staples 18 gauge, Washburn and Moen.

§ 178.186-17 End supporting battens.¹

(a) At least $1\frac{1}{8}$ " wide and same thickness as cleats; fastened securely across ends parallel to side cleats; required so that unsupported distance between cleats, battens, and between cleats and battens will be not greater than as follows:

Thickness of ends (inch):	Maximum spacing (inches)
0 125.....	10
0 143.....	11
0 167.....	12
0 187.....	13
0 219.....	14
0 250.....	15
0 313.....	16

§ 178.186-18 Side cleat battens and wired end supports.

(a) *Side cleat battens.* At least $1\frac{3}{16}$ " by $1\frac{3}{16}$ "; fastened securely to ends so as to be adjacent to side cleats when box is set up; required, in addition to any other battens, when authorized gross weight exceeds the following:

Group of wood in cleats:	Authorized gross weight, box and contents, over (pounds)
1.....	100
2.....	150
3.....	200
4.....	200

(b) *Wired end supports.* Wired ends, for boxes for authorized gross weight exceeding the foregoing, must be reinforced by 2 strips (liners), at least $1\frac{1}{4}$ " wide and as thick as ends, securely stapled along edges of the end parallel to the wires; side cleat battens not required.

§ 178.186-19 Marking.

(a) Marking on each box with letters and figures at least $\frac{1}{2}$ " high in rectangle as follows.

DOT-16B***

(1) Stars must be replaced by maximum authorized gross weight (for example, DOT-16B315, etc.).

¹ Not required for wired ends less than 20 inches long.

(b) The name or symbol of person making the marks specified in paragraph (a) of this section must be located just above, below, or following those marks. Symbol, if used, must be registered with the Bureau of Explosives.

§ 178.186-20 Setting up and closing.

(a) Nail or staple unwired ends to side cleats at intervals not over $2\frac{1}{2}$ "; fasten wired ends securely by means of loop fasteners. *Provided.* That ends at least $\frac{7}{16}$ " thick may be nailed with cement-coated nails through sides, top, and bottom of box into the ends at 3" intervals.

(b) Twist ends of binding wires or bend loops to give tight closure.

(c) Nail at least 2 nails through side cleats into each side-cleat batten at not over 4" intervals; nail through top and bottom cleats with one 7-penny nail into each end of end-supporting battens.

§ 178.186-21 Special box.

(a) Gross weight not over 500 pounds. Must comply with this specification except as follows: Sides, top, bottom, and ends, to be of group 2 or 3 wood having minimum thickness of $\frac{1}{4}$ " for boxes not over 315 pounds gross weight, $\frac{3}{16}$ " for boxes not over 400 pounds gross weight, and $\frac{3}{8}$ " for boxes not over 500 pounds gross weight. Size of end cleats must be at least $1\frac{3}{16}$ " x $\frac{7}{8}$ " and ends must have horizontal supporting battens at least $1\frac{3}{8}$ " x $1\frac{3}{16}$ ". One batten is required for boxes not over 200 pounds gross weight and three battens for others. Ends must be held in place by one metal strap at least $\frac{5}{8}$ " x 0.020" completely around the box stapled to the middle end battens. When size of box will not permit the application of all prescribed binding wires during manufacture, the additional binding wires of prescribed number and size, or metal straps of equal number and strength, must be applied after closing. At least three-binding wires must be applied to boxes not over 200 pounds gross weight and at least four to boxes over 200 pounds gross weight by the box manufacturer. Binding wires for boxes over 400 pounds gross weight

must be of size and number prescribed for boxes not over 400 pounds gross weight.

§ 178.187 Specification 16D; wooden wirebound overwrap for inside containers.

§ 178.187-1 Material requirements.

(a) Lumber shall be as follows:

(1) Lumber shall be well seasoned and commercially dry; free from decay, objectionable knots, slanting shakes, sharp cross grain, and other defects that materially lessen the strength. Grain of wood in cleats and battens must not cross piece within its length.

(2) Authorized tolerances; cleats, battens and handles, minus $\frac{1}{32}$ inch; single thickness veneer, minus 5 percent; resawn boards, $\frac{1}{4}$ inch below specified thickness for boards up to $\frac{7}{16}$ inch thick and $\frac{1}{16}$ inch below specified thickness for boards $\frac{1}{4}$ inch or more thick.

(3) Woods authorized are in the following groups:

GROUP 2

Southern yellow pine.	North Carolina pine
Hemlock.	Douglas fir.
	Larch (tamarack).

GROUP 3

White elm.	Black gum.
Red gum.	Tupelo.
Sycamore.	Maple—soft or silver.
Pumpkin ash	
Black ash	

GROUP 4

Hard maple.	Birch.
Beech.	Rock elm.
Oak.	White ash.
Hackberry.	Hickory.

(b) Binding wires and staples shall be as follows:

(1) Of annealed steel or other material of equal strength, Washburn and Moen sizes.

§ 178.187-2 Construction requirements.

(a) Wirebound overwrap for drum-type inside container shall be constructed in accordance with the following:

Wirebound containers	Marked capacity of inside containers			
	Not over 5 gallons	Not over 15 gallons	Not over 30 gallons	Not over 55 gallons
<i>Faceboard thickness (sides only)</i>	.			
Group 2 woods.....	$\frac{1}{8}$ " veneer.....	$\frac{1}{4}$ " resawn.....	$\frac{3}{16}$ " resawn.....	$\frac{3}{8}$ " resawn.....
Group 3 or 4 woods.....	do.....	do.....	$\frac{1}{4}$ " resawn.....	Do.
<i>Cleats, mitered</i>				
Outside cleats, Group 2, 3, or 4 woods.....	$1\frac{3}{16}$ " x $7\frac{1}{8}$ ".....	$1\frac{3}{16}$ " x $7\frac{1}{8}$ ".....	$1\frac{3}{16}$ " x $7\frac{1}{8}$ ".....	$1\frac{3}{16}$ " x $7\frac{1}{8}$ ".....
<i>Binding wires</i>				
Number and gauge over outside cleats.....	2-14 gauge.....	2-12 gauge.....	2-11 gauge.....	2-11 gauge.....
Number and gauge intermediate wires.....	1-14 gauge.....	3-12 gauge.....	4-12 gauge.....	3-12 gauge.....
<i>Staples (length, gauge and spacing)</i>				
In outside cleats.....	$1\frac{1}{4}$ "-16 gauge.....	$1\frac{1}{4}$ "-16 gauge.....	$1\frac{1}{4}$ "-16 gauge.....	$1\frac{1}{4}$ "-16 gauge.....
Over intermediate wires.....	$3\frac{3}{4}$ "-18 gauge.....	$7\frac{1}{8}$ "-18 gauge.....	$7\frac{1}{8}$ "-18 gauge.....	$2\frac{1}{4}$ "-18 gauge.....
Maximum spaces between staples.....	$1\frac{1}{4}$ ".....	$1\frac{3}{4}$ ".....	$1\frac{3}{4}$ ".....	$1\frac{3}{4}$ ".....
<i>Tops and bases (group 2, 3, or 4 woods)</i>				
Faceboard thickness.....	$\frac{1}{4}$ " resawn.....	$\frac{3}{8}$ " resawn.....	$\frac{9}{16}$ ".....	$1\frac{1}{8}$ ".....
Battens (2 rows of 4).....	$1\frac{3}{8}$ " x $1\frac{1}{4}$ ".....	$1\frac{3}{8}$ " x $1\frac{1}{4}$ ".....	$1\frac{3}{8}$ " x $1\frac{1}{4}$ ".....	$1\frac{3}{8}$ " x $1\frac{1}{4}$ ".....
Staples or cement coated nails.....	$1\frac{1}{4}$ "-18 gauge.....	$1\frac{1}{4}$ "-16 gauge.....	22-4d nails.....	$1\frac{1}{4}$ "-14 gauge.....

(1) Staples for wires over cleats driven through boards into cleats and anchored; others through boards and clinched.

(2) Container shall be closed with threaded loop fastener with "Z" clinch for all capacities except 5 gallons for which regular clinch is authorized.

(3) Where binding wire closure clinches contact inner container, $1\frac{1}{2}$ inches wide water-resistant fabric cloth with plastic coated backing and pressure-sensitive adhesive or other suitable means shall be applied in a single strip across clinches, or other equally efficient methods may be used.

(b) Wirebound overwrap for bottle-constructed in accordance with the following: type inside container shall be con-

Wirebound containers	Marked capacity of inside containers		
	Not over 6½ gallons (rectangular overwrap)	Not over 13 gallons (rectangular overwrap)	Not over 13 gallons (cylindrical overwrap)
<i>Faceboard thickness (sides only)</i>			
Group 2 woods.....	5⁄8"	3⁄4"	3⁄8"
Group 3 woods.....	1⁄4" resawn	5⁄16"	5⁄16"
Group 4 woods.....	do.	do.	Do.
<i>Cleats</i>			
Outside and interrupted cleats..	13⁄16" x 7⁄8"	13⁄16" x 7⁄8"	13⁄16" x 5⁄8"
Intermediate cleats.....	5½" x 3⁄8"	5½" x 3⁄8"	Outside cleats only.
<i>Binding wires</i>			
Number and gauge over outside cleats..	2-13 gauge.....	2-12 gauge.....	2-12 gauge.
Number and gauge over intermediate cleats or intermediate wires.	2-14 gauge (not over 5 gallons).	4-13 gauge...	Do.
<i>Staples</i>			
In outside and interrupted cleats.....	1½"-16 gauge.....	1½"-16 gauge.....	1½"-16 gauge.
In intermediate cleats.....	7⁄8"-16 gauge.....	7⁄8"-16 gauge.....	None.
Over intermediate wires.....	7⁄16"-18 gauge.....	7⁄16"-18 gauge.....	No 2" gap in staples required.
Note: A 2" gap between staples must be provided in the center of each line of staples over the intermediate cleats.			
<i>Top^{1,2}</i>			
Face material thickness.....	9⁄16"	13⁄16"	9⁄16"
Battens.....	13⁄8" x 3⁄16"	13⁄8" x 13⁄16"	3⁄8" x 13⁄16"
<i>Base</i>			
Face material thickness..	3⁄8"	3⁄8"	9⁄16"
Edge strips.....	1½" x 3⁄8"	3½" x 3⁄8"	3⁄8" x 13⁄16"
Center strips.....	3½" x 3⁄8"	do.	(Battens.)

¹ A hole of suitable type may be left in top of box to provide for protruding neck of inner container.

² Exterior grade plywood ½" thick with no battens is authorized.

(1) Containers shall be closed with threaded loop fasteners using a regular clinch.

§ 178.187-3 Assembly.

(a) Overwrap shall be constructed to provide a snug fit for the inside container.

(b) Overwrap inside surfaces shall be reasonably smooth and free from projections which would damage inside container.

§ 178.187-4 Tests.

(a) Wirebound overwrap; when assembled as for use, shall withstand the tests prescribed for specified inside containers. The completed package must withstand these tests without serious rupture of the overwrap and without producing a condition of the overwrap that could result in potential damage to the inside container.

§ 178.187-5 Marking authorized.

(a) Marking on each overwrap with letters and figures at least ½ inch high in rectangle as follows:

DOT-16D

(b) The name or symbol of person making the mark specified in paragraph (a) of this section must be located just above, below, or following that mark. Symbol, if used, must be registered with the Bureau of Explosives.

§ 178.190 Specification 19A; wooden boxes, glued plywood cleated.

§ 178.190-1 Compliance.

(a) Required in all details.

§ 178.190-2 Three-way corners.

(a) Three-way corners (when specified in §§ 178.190-3 to 178.190-13) shall be of type so nailing will be into edge grain of cleats, unless otherwise specified.

§ 178.190-3 Lumber.

(a) Well seasoned and commercially dry; free from decay, loose knots, knots that would interfere with nailing, and other defects that would materially lessen the strength. Cleats to be free from knots and grain of wood must not cross cleat in less than one-half its length.

(b) To be at least 3-ply, except for cleats; each ply glued in place with grain at right angles to the one next.

§ 178.190-4 Nails.

(a) Cement coated and of size specified for "sinkers", "coolers", and "3-ply-veneer nails" as generally known to the trade.

§ 178.190-5 Grouping of principal woods.

(a) Grouping as follows:

GROUP 1

White pine.	Chestnut.
Norway pine.	Sugar pine.
Aspen (popple).	Cypress.
Spruce.	Basswood.
Western (yellow) pine.	Willow.
Cottonwood.	Noble fir.
Yellow poplar.	Magnolia.
Balsam fir.	Buckeye.
Cedar.	White fir.
Redwood.	Alpine fir.
Butternut.	Lodgepole pine.
Cucumber.	Jack pine.

GROUP 2

Southern yellow pine.	North Carolina pine.
Hemlock.	Douglas fir.
	Larch (tamarack)

GROUP 3

White elm.	Black ash.
Red gum.	Black gum.
Sycamore.	Tupelo.
Pumpkin ash.	Maple—soft or silver.

GROUP 4

Hard maple.	Birch.
Beech.	Rock elm.
Oak.	White ash.
Hackberry.	Hickory.

§ 178.190-6 Three-way corners.

(a) Three-way corners required; except for authorized gross weight not over 75 pounds.

§ 178.190-7 Cleats required.

(a) Two on each face at opposite edges; others as necessary so that cleats are not over 12" apart. These to extend full length of face.

(b) Others, if necessary, to provide nailing surface at each box edge.

§ 178.190-8 Parts and dimensions.

(a) Parts and dimensions as follows:

Authorized gross weight	Ply wood minimum thickness ¹	Cleats of group 1 or 2 woods ¹		Cleats of group 3 or 4 woods ¹	
		Minimum thickness	Minimum width	Minimum thickness	Minimum width
<i>Pounds</i>	<i>Inch</i>	<i>Inch</i>	<i>Inches</i>	<i>Inch</i>	<i>Inches</i>
50.....	3/40	1/2	1 1/2	1/2	1 1/2
75.....	3/40	9/16	1 1/4	1/2	1 1/2
100.....	2/16	3/8	1 3/4	1/2	1 1/2
150.....	3/16	1 1/16	2 1/4	1/2	1 1/2
200.....	3/12	3/4	2 1/4	9/16	1 1/4
300.....	3/12	13/16	2 7/8	3/4	1 3/4
400.....	3/12	7/8	2 3/4	1 1/16	2 1/4

¹ Variation authorized of 1/4 prescribed thickness of any part not to exceed 10 percent of its area. Cleats at least 1/4" thick, of cross section equivalent to prescribed cleats are authorized.

§ 178.190-9 Marking.

(a) Marking on each container with letters and figures at least 1/2" high in rectangle as follows:

DOT-19A***

(1) The stars must be replaced by authorized gross weight (for example, DOT-19A200).

(2) Name or symbol of person making the mark specified in paragraph (a) (1) of this section and located just above, below, or following that mark. Symbol, if used, must be registered with the Bureau of Explosives.

§ 178.190-10 Setting up and closing all boxes.

(a) Each edge of each plywood section secured with 3-ply-veneer cement coated nails, or staples, at 3" intervals as follows:

(1) To face of cleat; clinching required; cement coating optional.

(2) To edge of cleat; except when nailing through a cleat in which case nail as in § 178.190-13.

§ 178.190-11 Boxes with 3-way corners.

(a) Each cleat forming 3-way corner to be nailed with 2 nails at each end into edge of adjoining cleat.

§ 178.190-12 Boxes without 3-way corners.

(a) Each edge cleat to be nailed to cleat on adjoining face.

§ 178.190-13 Nails and nailing under §§ 178.190-11 and 178.190-12.

(a) To be cement coated and as follows:

Nails—cement coated				
Cleats— thickness (inch)	Group 1 or 2 woods		Group 3 or 4 woods	
	Size (penny)	Spacing (inches)	Size (penny)	Spacing (inches)
1/4	5	13/4	4	11/2
3/8	6	2	5	13/4
1/2	6	2	5	13/4
5/8	7	2 1/4	6	2
3/4	7	2 1/4	6	2
7/8	8	2 1/2	7	2 1/4
1	9	2 3/4	8	2 1/2

§ 178.191 Specification 19B; wooden boxes, glued plywood, nailed.

§ 178.191-1 Compliance.

(a) Required in all details.

§ 178.191-2 Authorized gross weight.

(a) Authorized gross weight not to exceed 150 pounds.

§ 178.191-3 Plywood.

(a) Plywood shall be made from veneer which has been rotary cut, sliced or sawed. It shall be well seasoned and commercially dry; free from decay, objectionable knots, that interfere with nailing, splits, gaps, and other defects that materially lessen the strength. Plywood shall be of good commercial box or sheathing grade.

(b) Plywood shall be at least 5 ply; each ply alternately glued with the grain at right angles to the one next.

§ 178.191-4 Nails.

(a) Cement coated and of size specified for "sinkers" or "coolers" as generally known to the trade.

(b) Nail spacing as follows:

Nail (size) in penny	Maximum spacing when driven into end and corner posts	
	Side grain	End grain
	Inches	Inches
Threepenny	13/4	1
Fourpenny	1 1/2	1 1/4
Fivepenny	1 1/4	1 1/4
Sixpenny	1 1/4	1 1/4
Sevenpenny	1 1/4	1 1/4
Eightpenny	2 1/2	2 1/4
Ninepenny	2 1/2	2 1/4
Tenpenny	3	2 1/2

§ 178.191-5 Corner construction.

(a) Boxes exceeding 35 pounds gross weight must have 4 vertical corner posts, or other equally suitable devices or fasteners; nailed lap-joint permitted for others.

§ 178.191-6 Assembly.

(a) Assemble with grain of outer plywood face in the direction of the longest faces of the box and securely nail or fasten to corner posts or ends as provided in §§ 178.191-4 and 178.191-5.

§ 178.191-7 Special tests.

(a) Samples of each type and size manufactured, taken at random, and filled with dummy contents the shape and size of expected contents, or with sand or sawdust, to the gross weight at which container is marked, closed as for use, must be capable of withstanding the following tests without serious rupture or exposure of contents:

(1) 8 drops from height of 1 foot, one on each corner, onto solid concrete.

§ 178.191-8 Closing for shipment.

(a) Box to be securely closed. Nails, if used, must be as prescribed in § 178.191-3; hinges and hasps or other equally efficient device authorized.

§ 178.191-9 Marking.

(a) Marking on each container with letters and figures at least 1/2" high in rectangle as follows.

DOT-19B***

(1) The stars must be replaced by authorized gross weight (for example DOT-19B150).

(2) Name or symbol of person making the mark specified in paragraph (a)(1) of this section and located just above, below, or following that mark. Symbol, if used, must be registered with the Bureau of Explosives.

§ 178.193 Specification 18B; wooden kits.

§ 178.193-1 Compliance.

(a) Required in all details.

§ 178.193-2 Tops and bottoms.

(a) Pieces to be glued together.

§ 178.193-3 Parts required and dimensions.

(a) Parts required and dimensions as follows:

Authorized gross weight (pounds)	Thickness (minimum)		Hoops (minimum)		
	Top and bottom (inch)	Staves (inch)	Number	Width (inch)	Gauge ¹
25.....	$\frac{1}{4}$	$\frac{3}{4}$	3	$\frac{9}{16}$	23
40.....	$\frac{1}{2}$	$\frac{1}{2}$	3	$\frac{5}{8}$	23

¹ Birmingham wire gauge (number).

§ 178.193-4 Middle hoop.

(a) Middle hoop of No. 11 gauge wire authorized.

§ 178.193-5 Type test.

(a) Sample, filled with dry, finely powdered material to authorized gross weight and closed as for use, shall withstand, without leaking, a drop from height of 4 feet onto solid concrete so as to strike diagonally on top chime.

§ 178.193-6 Marking.

(a) Marking on each container plainly as follows:

(1) DOT-18B; followed by the authorized gross weight (for example, DOT-18B25).

(2) Name or symbol of person making the mark specified in paragraph (a)(1) of this section and located just above, below, or following that mark.

Symbol, if used, must be registered with the Bureau of Explosives.

§ 178.193-7 Size of mark.

(a) Size of mark (minimum). $\frac{1}{2}$ " high.

§ 178.194 Specification 20WC wooden protective jacket.

§ 178.194-1 General requirements.

(a) Each jacket must meet the applicable requirements of § 173.24 of this subchapter.

(b) Maximum gross weight of the jacket plus the contents may not exceed the following:

(1) Specification 20WC-1: 225 kilograms (500 pounds).

(2) Specification 20WC-2: 225 kilograms (500 pounds).

(3) Specification 20WC-3: 455 kilograms (1000 pounds).

(4) Specification 20WC-4: 910 kilograms (2000 pounds).

(5) Specification 20WC-5: 1820 kilograms (4000 pounds).

(6) Specification 20WC-6: 2230 kilograms (6000 pounds).

§ 178.194-2 Materials of construction.

(a) The general configuration of the wooden protective jacket must be a hollow cylindrical shell constructed of one-piece discs and rings of plywood or solid hardwood reinforced with steel rods.

(1) The specification 20WC-2 must be additionally completely encased, snugly fit, within an 18-gauge steel shell. The steel shell must be provided with at least four 6 millimeter (0.25-inch) diameter vent holes. Each hole must be covered with durable weatherproof tape, or equivalent device.

(2) The specification 20WC-6 jacket must be additionally completely encased, snugly-fit, within a 12-gauge steel shell. The steel shell must be provided with at least twelve 1.2 centimeters (0.5-inch) diameter vent holes, located in 3 rows of 4 holes each, spaced at 90 degree intervals near the top, middle, and bottom of the drum. Each hole must be covered with durable weatherproof tape, or equivalent device.

(b) Plywood must be exterior-grade, void-free, Douglas fir (or equivalent) not more than 2.5 centimeters (1 inch) thick. Solid hardwood is authorized for specification 20WC-2 only.

(c) Discs and rings must be glued together with a strong, shock-resistant adhesive, such as either of the following:

(1) A resorcinol-formaldehyde adhesive, which has been bonded under both heat and pressure; or

(2) A polyvinyl-acetate emulsion, which has been reinforced with cement-coated nails. The nails must be randomly spaced and must be at least 2.5 times as long as the minimum thickness of the plywood discs or rings.

(d) Full-length steel rods are required for reinforcement and lid closure.

(1) The minimum number of rods and the minimum rod diameter are as shown in the following table:

Specification	Minimum number of rods	Minimum rod diameter	
		Inches	Millimeters
20WC-1.....	6	0.25	6.0
20WC-2.....	6	.25	6.0
20WC-3.....	12	.375	9.5
20WC-4.....	16	.375	9.5
20WC-5.....	16	.50	12.0
20WC-6.....	16	.50	12.0

(2) For specifications 20WC-1 and 20WC-2, steel rods must be equally spaced around the circumference to the rings and discs, midway between the O.D. and I.D. of the rings. For specifications 20WC-3 and 20WC-4, bolts may be staggered alternately in two rows, at ± 1.2 centimeters (0.5-inch) from the line midway between the O.D. and I.D. of the rings. For specifications 20WC-5 and 20WC-6, bolts may be staggered alternately in two rows at ± 2.5 centimeters (1 inch) from the line midway between the O.D. and I.D. of the rings.

(3) Rod ends must be threaded and secured with lock nuts and steel washers, or equivalent device, to provide at least a 2.5 centimeters (1 inch) diameter bearing surface on each end. Ends of the rods must terminate 1.4 centimeters (0.75-inch) below the surface of the plywood for specifications 20WC-1 and 20WC-2. For specifications 20WC-3, 20WC-4, 20WC-5 and 20WC-6, the ends of the rods must terminate 3.7 centimeters (1.5 inches) below the surface of the ply-

wood, and that portion of each end disc which extends beyond the rod ends must be further held in place with lag screws at least 10 centimeters (4 inches) long.

(e) Thickness of wooden shell:

(1) Specification 20WC-1: At least 10 centimeters (4 inches) thick.

(2) Specification 20WC-2: At least 7.5 centimeters (3 inches) thick.

(3) Specification 20WC-3: At least 13 centimeters (5 inches) thick for the jacket wall, and at least 15 centimeters (6 inches) thick for the end discs. In addition, at least 3 plywood chines, 5 centimeters (2 inches) wide and protruding 5 centimeters (2 inches) beyond the outer surfaces, must be located at each end and midway along the length of the jacket.

(4) Specification 20WC-4: At least 15 centimeters (6 inches) thick for the jacket wall, and at least 15 centimeters (6 inches) thick for the end discs. In addition, at least 3 plywood chines, 5 centimeters (2 inches) wide and protruding 5 centimeters (2 inches) beyond the outer surfaces, must be located at each end and midway along the length of the jacket.

(5) Specifications 20WC-5 and 20WC-6: At least 15 centimeters (6 inches) thick for the jacket wall, and at least 20 centimeters (8 inches) thick for the end discs. In addition, at least 5 plywood chines, 5 centimeters (2 inches) wide and protruding 5 centimeters (2 inches) beyond the outer surfaces, must be located at each end and equally spaced along the length of the jacket.

§ 178.194-3 Closure.

(a) Closure for the wooden protective jacket is provided by the steel reinforcing rods. The end cap (lid) must fit tightly to the body of the jacket to prevent a heat path to the inside of the jacket. The lid joint for specifications 20WC-3, 20WC-4, 20WC-5, and 20WC-6, may not be coplanar with the end of the inner containment vessel.

(b) Specifications 20WC-2 and 20WC-6. Locking ring closure, if used, must conform to § 178.104-4. Flanged closure, if used, must have at least 8 steel bolts (at least 6 millimeters (0.25-inch) diameter for 20WC-2 or 1.2 centimeters (0.50-inch) diameter for 20WC-6) and lock nuts (or equivalent device), spaced not

more than 13 centimeters (5 inches) between centers.

§ 178.194-4 Tests.

Prior to each use, each jacket must be visually inspected for defects such as improper bonding, cracking, corrosion of steel rods, and improperly fitting closure lid, or other manufacturing defects. Particular attention must be given to any separation of the plywood discs and rings which would provide a heat path to the inside of the jacket.

§ 178.194-5 Painting.

Each jacket (other than 20WC-2 and 20WC-6) must be completely painted with a high quality exterior weather resistant paint.

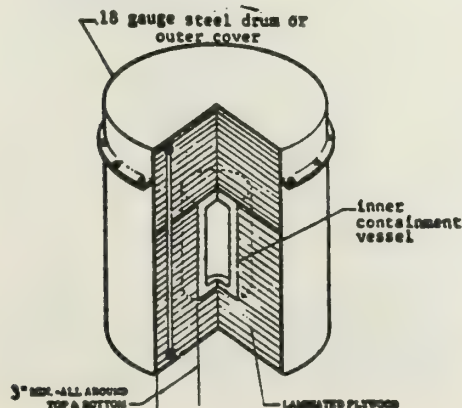
§ 178.194-6 Marking.

(a) Each jacket must be marked on the external surface as follows: "USA-DOT 20 WC-() TYPE B." The appropriate numeral must be inserted in the marking to indicate the appropriate specification 20WC category: e.g., "20WC-2."

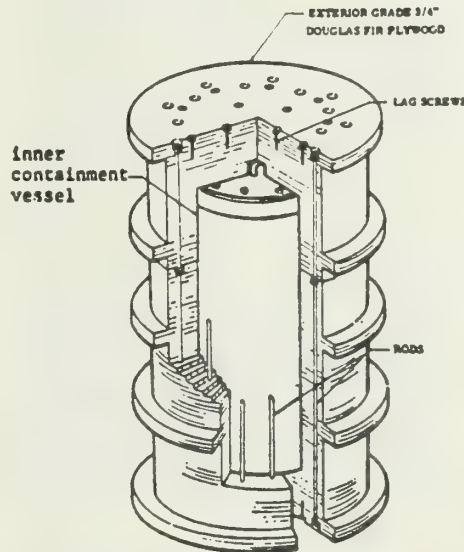
(b) Each jacket must also be marked with the name or symbol of person making the marks specified in paragraph (a) of this section. Symbol, if used, must be registered with the Bureau of Explosives.

§ 178.194-7 Typical assembly sketches.

(a) Spec. 20WC-2.



(b) Spec. 20WC-5.



§ 178.195 Specification 21WC wooden-steel protective overpack.

§ 178.195-1 General requirements.

(a) Each jacket must meet all the applicable requirements of § 173.24 of this subchapter.

(b) The maximum authorized gross weight of the overpack, including its inner container and contents may not exceed 1360 kilograms (3000 pounds).

§ 178.195-2 Materials of construction and other requirements.

(a) The general configuration of the protective overpack must be a combination of two nested plywood boxes, each 2.5 centimeters (1 inch) thick, nested within a third wooden box of nominal 5 centimeters (2-inch) thickness solid hardwood. The three nested boxes must be enclosed within a welded framework 10 cement-coated nails spaced on nominally 1 centimeter ($\frac{3}{8}$ -inch) thick by 8-10 centimeters (3-4 inches) wide. All outer surfaces of each box must be coated with intumescent paint.

(b) Plywood must be exterior-grade, void-free, Douglas fir, or equivalent, at least 2.5 centimeters (1 inch) thick.

Solid hardwood must be maple, or equivalent.

(c) All box joints and interior surfaces must be glued with a strong, shock-resistant adhesive such as polyvinylacetate emulsion, or equivalent.

(d) All hardwood joints must be mitered, or equivalent, reinforced with No. 10 cement-coated nails space on nominal 15 centimeters (6-inch) centers.

(e) All plywood joints must be butt-type, or equivalent, reinforced with No. 10 cement-coated nails spaced on nominal 15 centimeters (6-inch) centers.

(f) The angles and strapping of the metal frame must be spaced such that separation distances do not exceed 15 centimeters (6 inches).

(g) The lid must be of the same material as the box and fabricated in such a manner that closure forms a mitered joint with the hardwood box and 2 stepped-joints with the plywood boxes.

§ 178.195-3 Closure.

Closure for the protective overpack must be provided by at least 4 mild steel

hinges formed from minimum 2.5-centimeter (1-inch) x 5-millimeter (3/16-inch) bar stock. Hinge pins must be minimum 6-millimeter (1/4-inch) diameter by 13.3 centimeters (5 1/4 inches) long mild steel rod drilled at both ends for cotter pins.

§ 178.195-4 Tests.

Prior to each use, each overpack must be visually inspected for defects such as wood checking or splintering, weld cracking, corrosion of steel parts, improper joint bonding, or improperly fitting closure lid.

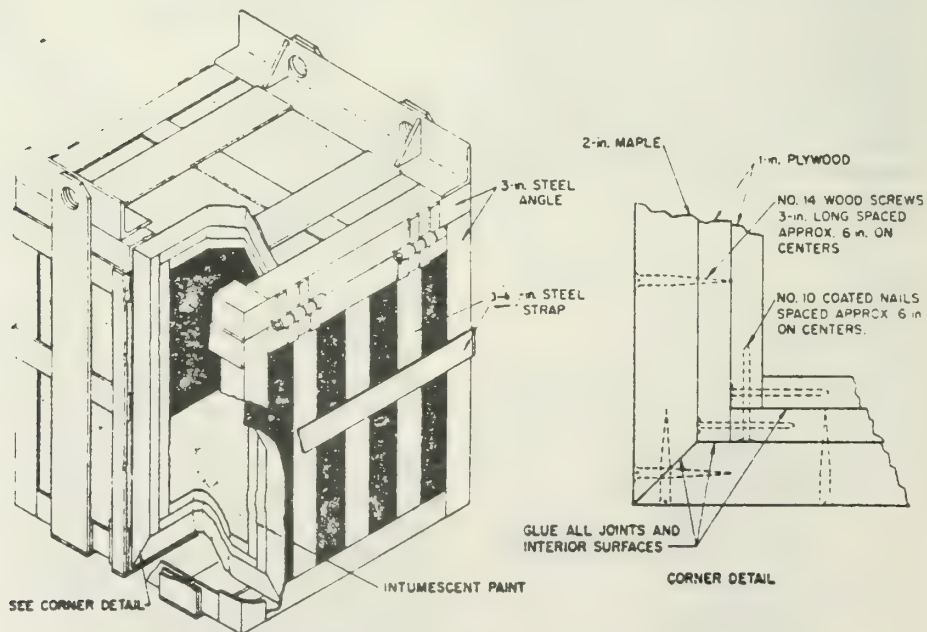
§ 178.195-5 Required marking.

(a) Marking must be as prescribed in § 173.24 of this subchapter.

(b) Marking on the outside of each overpack must include the following:

(1) "USA-DOT 21WC" and "TYPE B" as appropriate.

§ 178.195-6 Typical assembly detail.



RADIOISOTOPES SHIPPING CASK FIRE AND IMPACT SHIELD

§ 173.196 Specification 22A: wooden drums, glued plywood.

§ 178.196-1 Compliance.

(a) Required in all details.

§ 178.196-2 Lumber.

(a) To be well seasoned, commercially dry, and free from decay, loose knots, knots that would interfere with nailing, and other defects that would materially lessen the strength.

§ 178.196-3 Woods required for plywood.

(a) As follows:

GROUP 3

White elm.	Black gum.
Red gum.	Tupelo.
Sycamore.	Maple—soft or silver.
Pumpkin ash.	
Black ash.	

GROUP 4

Hard maple.	Birch.
Beech.	Rock elm.
Oak.	White ash.
Hackberry.	Hickory.

§ 178.196-4 Plywood.

(a) At least 2-ply for body and 3-ply for heads; all plies glued together cross grain.

§ 178.196-5 Hoops and battens.

(a) Grain of wood must not cross piece within $\frac{1}{2}$ of its length. Hoops to be of elm.

Exception: Plywood hoops 0.28" thick are authorized.

§ 178.196-6 Parts and dimensions.

(a) Parts and dimensions as follows:

Maximum net weights authorized	Thickness (minimum)		Size of hoops (minimum)		Head liners (minimum)
	Body	Heads	Wooden	Metal ¹	
Pounds	Inch	Inch	Inch	Inch	Inch
33.....	0.16	$\frac{3}{8}$	$\frac{1}{4} \times 2$	$0.023 \times 1\frac{1}{16}$	$\frac{1}{8} \times \frac{3}{8}$
56.....	.18	$\frac{3}{8}$	$\frac{1}{4} \times 2$	$0.015 \times 2\frac{3}{8}$	$\frac{1}{8} \times \frac{3}{8}$
115.....	.20	$\frac{3}{8}$	$\frac{1}{4} \times 2\frac{1}{4}$	$0.023 \times 1\frac{1}{16}$	$\frac{1}{4} \times \frac{3}{8}$
200.....	.28	0.43	$\frac{1}{4} \times 3$	$0.015 \times 2\frac{3}{8}$	$\frac{1}{4} \times \frac{3}{8}$

¹ Authorized only when metal hoop is between body of drum and wooden hoop as described in § 178.196-8.

² On drums of not over 10½ gallons capacity having authorized maximum net weights not over 115 pounds, additional outside headliners may be used in lieu of metal hoops provided containers will pass prescribed tests. (See § 178.196-14.)

§ 178.196-7 Body joints.

(a) To be made by steel strip 0.015" x 1½" secured by staples, clinched, at 1½" centers, or by other method giving equivalent strength; also to be made sift-proof by 2 thicknesses of 3" paper tape 60-pound strength, Mullen or Cady test, or other equivalent protection.

NOTE 1: Because of the present emergency and until further order of the Department, tape 2½" may be used.

§ 178.196-8 Hoops.

(a) One wooden and 1 metal required at each chime; wooden hoops secured by staples, clinched, at 3" centers; metal hoops to be outside wooden hoops and secured by punching, or other equivalent method, at 6" centers.

§ 178.196-9 Head battens.

(a) Required for heads over 15" diameter; ¾" x 3", minimum; ends rounded to fit chime.

§ 178.196-10 Head liners.

(a) Required inside and outside for full circumference of heads. To be securely fastened by staples or nails, clinched.

§ 178.196-11 Head lining paper.

(a) Required for each head; 1½" larger than head diameter; of No. 1 Kraft paper 90 pounds per ream (480 sheets 24" x 36") or equivalent.

NOTE 1: Because of the present emergency and until further order of the Department, a ream may consist of 500 sheets.

§ 178.196-12 Bung openings.

(a) Bung and bunghole authorized provided head lining paper is glued around hole.

§ 178.196-13 Insertion of head.

(a) As in § 178.196-16.

§ 178.196-14 Tests.

(a) Samples of each type and size taken at random, filled with dry, fine powder to the authorized net weight and closed as for use, must be capable of withstanding, without leakage, 2 drops diagonally on either end chime onto solid concrete from height of 4 feet.

§ 178.196-15 Marking.

(a) Marking on each container by marks ¾" high, as follows:

(1) DOT-22A, followed by authorized gross weight (authorized net weight plus approximate tare weight, for example, DOT-22A115).

(2) Name or symbol of person making the mark specified in paragraph (a)(1) of this section and located just above, below, or following that mark. Symbol, if used, must be registered with the Bureau of Explosives.

§ 178.196-16 Closing for shipment.

(a) *Closing heads.* Insert head lining paper, head, and head liner; nail with 15 gauge nails, clinched at 2" centers through head liner, body and wooden hoop; equivalent stapling authorized. Nail through steel hoop with two 7-penny nails into each end of head batten, if any.

§ 178.196-17 Bung closures.

(a) Bung closures (if any) must be well driven and secured sufficiently to prevent leakage in transit.

§ 178.197 Specification 22B; wooden drums, glued plywood.

§ 178.197-1 Compliance.

(a) Required in all details.

§ 178.197-2 Lumber.

(a) To be well seasoned, commercially dry, and free from decay, loose knots, knots that would interfere with nailing, and other defects that would materially lessen the strength.

§ 178.197-3 Woods required for plywood.

(a) Woods required as follows:

GROUP 3

White elm.	Black ash.
Red gum.	Black gum.
Sycamore.	Tupelo.
Pumpkin ash.	Maple—soft or silver.

GROUP 4

Hard maple.	Birch.
Beech.	Rock elm.
Oak.	White ash.
Hackberry.	Hickory.

§ 178.197-4 Plywood.

(a) At least 2-ply for body and 3-ply for heads; all plies glued together cross grain.

§ 178.197-5 Hoops and battens.

(a) Grain of wood must not cross piece within $\frac{1}{2}$ of its length. Hoops to be of elm. Exception: Plywood hoops 0.28" thick are authorized.

§ 178.197-6 Parts and dimensions.

(a) Parts and dimensions as follows:

Maximum net weights authorized	Thickness (minimum)		Size of hoops (minimum)		Head liners (minimum)
	Body	Heads	Wooden	Metal ¹	
Pounds	Inch	Inch	Inch	Inch	Inch
33.....	0.16	$\frac{3}{8}$	$\frac{1}{8} \times 2$	$0.023 \times 1\frac{1}{8}$	$\frac{1}{4} \times \frac{3}{8}$
56.....	.18	$\frac{3}{8}$	$\frac{1}{8} \times 2$	$0.015 \times 2\frac{3}{4}$	$\frac{1}{4} \times \frac{3}{8}$
115.....	.20	$\frac{3}{8}$	$\frac{1}{8} \times 2\frac{1}{4}$	$0.023 \times 1\frac{1}{8}$	$\frac{1}{4} \times \frac{3}{8}$
200.....	.28	0.43	$\frac{1}{4} \times 3$	$0.015 \times 2\frac{3}{4}$	$\frac{1}{4} \times \frac{3}{8}$
				$0.028 \times 1\frac{1}{8}$	$\frac{1}{4} \times \frac{3}{8}$

¹ Authorized only when metal hoop is between body of drum and wooden hoop as described in § 178.197-8.

² On drums of not over 10½ gallons capacity having authorized maximum net weights not over 115 pounds, additional outside headliners may be used in lieu of metal hoops provided containers will pass prescribed tests. (See § 178.197-13.)

§ 178.197-7 Body joint.

(a) Joint to be made by steel strip $0.015'' \times 1\frac{1}{2}''$ secured by staples, clinched, at $1\frac{1}{4}''$ centers, or by other method giving equivalent strength.

§ 178.197-8 Hoops.

(a) One wooden and 1 metal required at each chime; wooden hoops secured by staples, clinched, at 3" centers; metal hoops to be outside wooden hoops and secured by punching, or other equivalent method, at 6" centers.

§ 178.197-9 Head battens.

(a) Required for heads over 15" diameter $\frac{3}{4}'' \times 3''$, minimum; ends rounded to fit chime.

§ 178.197-10 Head liners.

(a) Required inside and outside for full circumference of heads. To be securely fastened by staples or nails, clinched. Inside head liners not required when close fitting inside metal drum or strong container is used.

§ 178.197-11 Bung or other openings in head.

(a) Bung and bunghole authorized provided head lining paper is glued around hole. Holes are permitted in heads to provide for closing devices of

inside metal drums or other strong inside containers when plywood drum is so equipped.

§ 178.197-12 Insertion of head.

(a) As in § 178.197-15.

§ 178.197-13 Tests.

(a) Samples of each type and size taken at random, filled with dry, fine powder to the authorized net weight and closed as for use, must be capable of withstanding, without leakage, 2 drops diagonally on either end chime onto solid concrete from height of 4 feet.

§ 178.197-14 Marking.

(a) Marking on each container by marks $\frac{3}{4}$ " high, as follows:

(1) DOT-22B, followed by authorized gross weight (authorized net weight plus approximate tare weight, for example, DOT-22B235).

(2) Name or symbol of person making the mark specified in paragraph (a) (1) of this section and located just above, below, or following that mark. Symbol, if used, must be registered with the Bureau of Explosives.

§ 178.197-15 Closing for shipment.

(a) *Closing heads.* Insert head lining paper, head, and head liner; nail with 15 gauge nails, clinched at 2" centers through head liner, body and wooden hoop; equivalent stapling authorized. Nail through steel hoop with two 7-penny nails into each end of head batten, if any.

§ 178.197-16 Bung closures.

(a) Bung closures (if any) must be well driven and secured sufficiently to prevent leakage in transit.

§ 178.198 Specification 22C; plywood drum for plastic inside container.

§ 178.198-1 Material requirements.

(a) Plywood shall be as follows:

(1) Plywood for body and heads shall be of good commercial or sheathing grade hardwood veneer. Veneer plies shall be firmly glued together with waterproof glue. A section of plywood from any part when immersed in water at room temperature for 48 hours shall show no delamination or separation of plies to qualify glue as waterproof.

(2) Plywood shall be well seasoned, commercially dry, and free from decay, loose knots that interfere with assembly, and other defects that would materially lessen the strength.

§ 178.198-2 Construction requirements.

(a) Plywood drum shall completely and snugly enclose body of inside container, or shall completely and snugly enclose body and neck of inside container. Top head of drum may have a hole of suitable size to provide for protruding neck of plastic container; bottom head may have drainage holes of suitable size. The following are required:

(1) Body shall be constructed of 2 shells, (see Note 1), butt-jointed, telescoped one within the other; outer shell shall be fastened on the outside with wire staples of not less than 17-gauge metal driven through a metal strip not less than 28-gauge by $1\frac{1}{2}$ inches width and each side of body joint. Staples shall be spaced not more than $1\frac{1}{2}$ inches apart and clinched on the inside. The grain of outside ply shall be paralleled and the grain of inner ply shall be vertical to plane of the heads.

NOTE 1: Each shell shall be of two-ply construction having minimum wall thickness of $\frac{1}{8}$ inch for inside container not over 6 $\frac{1}{2}$ gallons marked capacity and $\frac{3}{16}$ inch for inside container not over 14 gallons marked capacity.

(2) Body heads shall be of at least three-ply construction with grain of alternate plies at right angles, circled to fit snugly within the body shell. Each head shall have a minimum thickness of $\frac{3}{8}$ inch for inside container not over 6 $\frac{1}{2}$ gallons marked capacity and $\frac{7}{16}$ inch for inside container not over 14 gallons marked capacity. As an alternate, $\frac{1}{2}$ inch thick pine bottom heads are authorized.

(3) Hoops shall be of at least three-ply construction with grain of alternate plies at right angles. Hoops shall be fastened to body shell so that ends butt or slightly gap by driving wire staples of at least 17-gauge metal through hoop and body and be clinched on the inside; staples spaced on not less than 3 inches centers. Each hoop shall not be less than $\frac{5}{16}$ inch thickness by $2\frac{1}{2}$ inches width for inside container not over 14 gallons marked capacity, and not less than $\frac{1}{4}$ inch thickness by 3 inches width for inside container not over 6 $\frac{1}{2}$ gallons marked capacity.

(4) Head retaining rings shall be of hardwood veneer not less than $\frac{1}{8}$ inch thickness by $\frac{3}{4}$ inch width for inside container not over $6\frac{1}{2}$ gallons marked capacity, and not less than $\frac{3}{10}$ inch thickness by $\frac{3}{4}$ inch width for inside container not over 14 gallons marked capacity. The head retaining rings shall be fastened to the body shell with wire staples clinched on the inside of not less than 17-gauge metal spaced on 3 inch centers, except that bottom ring may be fastened by 14-gauge wire staples spaced on 4 inch centers.

(b) Plywood drum for plastic inside container not over 5 gallons marked capacity shall comply with requirements of § 178.198-1(a) (1) and (2) and paragraph (a) of this section.

(1) Body shells shall be of two-ply construction having a minimum thickness of $\frac{3}{16}$ inch and with grain of outside ply parallel and grain of inner ply vertical to plane of the heads. Body shall be butt-jointed and fastened on the outside with wire staples of not less than 17-gauge metal driven through a metal strip not less than 28-gauge by $1\frac{1}{2}$ inches width and each side of body joint. Staples shall be spaced not more than $1\frac{1}{2}$ inches apart and clinched on the inside.

(2) Body heads shall be of at least three-ply construction with grain of alternate plies at right angles circled to fit snugly within the body shell. Each head shall have a minimum thickness of $\frac{3}{4}$ inch.

(3) Hoops shall be of hardwood veneer, not less than $2\frac{1}{4}$ inches wide by $\frac{1}{8}$ inch thick. Hoops shall be fastened to the body by 17-gauge staples on not less than three-inch centers and shall be overlapped not less than 3 inches.

(4) Head retaining rings shall be of hardwood veneer of $\frac{1}{8}$ inch thickness by $\frac{3}{4}$ inch width except bottom rings may be two thicknesses, each $\frac{1}{8}$ inch thickness by $1\frac{3}{4}$ inches width. Rings shall be fastened to body shell with wire staples of 17-gauge metal on not less than 3-inch centers and clinched on inner surface.

§ 178.198-3 Tests.

(a) Samples taken at random with inner plastic container filled to marked capacity with water and closed as for use, shall be capable of withstanding prescribed tests without leakage from inside container or breakage of outside

container that would be of such a nature as to contribute to potential failure of inner container. Tests shall be made of each size by each company starting production. The type test is as follows:

(1) One 4-foot drop onto solid concrete so as to strike diagonally on either chime.

(2) Additional tests as required by inside container specification.

§ 178.198-4 Marking on outside container.

(a) Each outside container must be plainly marked with letters and figures at least $\frac{3}{4}$ inch high applied by hot branding iron or dark colored printing ink with high pressure dies as follows:

(1) DOT-22C.

(2) Name or symbol of person making the mark specified in paragraph (a) (1) of this section and located just above, or below that mark. Symbol, if used, must be registered with the Bureau of Explosives.

Subpart F—Specifications for Fiberboard Boxes, Drums, and Mailing Tubes

§ 178.205 Specification 12B; fiberboard boxes.

§ 178.205-1 Compliance.

(a) Required in all details.

§ 178.205-2 Definitions.

(a) Terms such as "200-pound test" mean minimum strength, Mullen or Cady test.

(b) "Joints" are where edges of parts of box, except recessed flanged heads, are connected together in setting up the box. Generally done by box maker.

(c) "Seams" are where edges of parts of box are visible, except joints, when box is closed.

§ 178.205-3 Classification of board.

(a) Fiberboard is hereby classified by strength¹ of completed board as in first column of the following table; weights specified in the table are the minimums authorized.

¹ Mullen or Cady test (minimum).

Classified strength ¹ of completed board	Solid fiberboard—Minimum combined weight of component plies exclusive of adhesives (pounds per 1,000 sq. ft.)	Facings for corrugated fiberboard	
		Double faced—Minimum combined weight of facings (pounds per 1,000 sq. ft.)	Double wall—Minimum combined weight of facings including center liner (pounds per 1,000 sq. ft.)
175	149	75	84
200	190	84	92
275	237	138	110
325	237	138	110
350	263	180	126
375	263	180	180
400	263	180	180
450	283	180	180

¹ Mullen or Cady test (minimum).

§ 178.205-4 Solid fiberboard.

(a) To be 3-ply or more; both outer plies water resistant.

§ 178.205-5 Corrugated fiberboard.

(a) Both outer facings water resistant; corrugated sheets must be at least 0.009 inch thick and weigh not less than 26 pounds per 1000 square feet; all parts must be securely glued together throughout all contact areas.

§ 178.205-6 Stitching staples.

Stitching staples must be made in such a configuration that their holding capability as installed will not be less than that of flat steep staples $\frac{3}{32}$ x 0.019 inch in cross section and not less than $\frac{7}{16}$ -inch wide.

§ 178.205-7 Tape.

(a) Coated with glue at least equal to No. 1 $\frac{3}{4}$ Peter Cooper standard. Cloth tape of strength, across the woof, at least 70 units, Elmendorf test. Sisal tape of 2 sheets of No. 1 Kraft paper, total weight 80 pounds per ream (500 sheets, 24" x 36"); sheets to be combined with asphalt and reinforced by unspun sisal fibers completely embedded in the asphalt and extending across the tape, except as provided in § 178.205-11(d). Other tapes of equal strength and efficiency are authorized.

(b) Tape for closure of slotted containers complying with the following requirements is authorized when applied as prescribed in § 178.205-17(a)(3):

(1) Tape must be not less than 3 inches wide and shall be made of two

sheets of 100 percent sulfate Kraft each not less than 30 pounds basis weight, reinforced with glass, sisal, or rayon fiber, combined with a laminant of asphalt or other material not affected by temperature extremes any more than would standard 180° to 200° softening point asphalt.

(2) Tape must be reinforced by lengthwise fibers spaced not more than an average of $\frac{1}{2}$ inch apart, and by crosswise fibers spaced not less than an average of 2 per inch except that when a diamond pattern is employed for crosswise reinforcement, the spacing between the parallel sides of the diamond measured in the machine direction must be not more than 1 inch.

(3) Glass of sisal reinforced tape must have a minimum tensile strength in the machine direction of 75 pounds per inch of width and a minimum tensile strength in the cross direction of 45 pounds per inch of width; rayon reinforced tape must have a minimum tensile strength in the machine direction of 57 pounds per inch of width and a minimum tensile strength in the cross direction of 27 pounds per inch of width with elongation not exceeding 15 percent. Tensile tests on the finished product shall be made on a 3-inch width sample.

§ 178.205-8 Test.

(a) Acceptable board must have prescribed strength, Mullen or Cady test, after exposure for at least 3 hours to normal atmospheric conditions (50 to 70 percent relative humidity), under test as follows:

(1) Clamp board firmly in machine and turn wheel thereof at constant speed of approximately 2 revolutions per second.

(2) Six punctures required, 3 from each side; all results but one must show prescribed strength.

(3) Board failing may be retested by making 24 punctures, 12 from each side; when all results but 4 show prescribed strength the board is acceptable.

(4) For corrugated fiberboard, double-pop tests may be disregarded.

§ 178.205-9 Types authorized.

(a) To be of solid or corrugated fiberboard of the following types, or as specifically provided for in § 178.205-19 to § 178.205-37:

(1) Slotted box; three-piece box without recessed ends; three-piece box of solid fiberboard with recessed ends; double-slide box; triple-slide box; tele-

scope box, with sections of equal depth, or with covers, top or bottom or both, with 3 inches overlap. (See § 178.205-14 (d) for boxes with single-flap closures.)

§ 178.205-10 Forming.

(a) Parts must be cut true to side and so creased and slotted as to fit closely into position without cracking, surface breaks, separation of parts outside of crease, or undue binding.

§ 178.205-11 Joints.

(a) For solid and corrugated fiberboard slotted containers: Lapped $1\frac{1}{2}$ inches from center of scoreline except as in § 178.205-12; stitched at $2\frac{1}{2}$ inch intervals and within 1 inch of each end of joint; body joint must be double-stitched (2 parallel stitches) at each end of joint over 18 inches long.

(b) For corrugated fiberboard slotted containers only: One butt joint taped (See § 178.205-7) is authorized; 3 inch tape required for boxes over 30 pounds authorized gross weight and 2 inch tape for others.

(c) For triple and double slide boxes: Joints of all slides must be taped (see § 178.205-7) for stitched; 3-inch tape required for boxes over 30 pounds authorized gross weight and 2-inch for others.

(d) For corrugated fiberboard only: One butt joint taped inside and outside with strips of one thickness of sulphate paper not less than 2 inches wide extending entire length of joint and firmly glued to box. For boxes not exceeding 65 pounds gross weight, outside strip of sulphate paper to be of basis weight not less than 60 pounds testing not less than 60 pounds and inside strip of sulphate paper to be of basis weight not less than 40 pounds testing not less than 40 pounds. For boxes exceeding 65 pounds gross weight, outside and inside with strips of sulphate paper which must each be of basis weight not less than 90 pounds testing not less than 90 pounds. Basis weight of paper shown is for 500 sheets, 24 x 36 inches.

(1) For glued lap joint, the sides of box forming joint must lap not less than $1\frac{1}{4}$ " and be firmly glued throughout entire area of contact with a glue or adhesive which cannot be dissolved in water after the film application has dried.

§ 178.205-12 Flanged heads.

(a) Must have 4 flanges, at least 1" long above fillet, on each head. Recessed flanged heads not authorized for boxes of corrugated fiberboard.

§ 178.205-13 Seams which are to be stitched.

(a) Overlap, if any, required to be at least $1\frac{1}{2}$ inches from center of scoreline except as in § 78.205-12.

§ 178.205-14 Flap closures.

(a) Fill-in pieces, of the same type fiberboard as used in construction of the container, are required where it is necessary to prevent an opening between the inner flaps, unless otherwise provided by paragraphs (b) and (c) of this section or by Part 173 of this chapter.

(b) If to be closed by adhesive, each inner flap must cover at least one-third of face; inner flaps must butt or have full overlap, or fill-in pieces must be used, unless otherwise provided by Part 173 of this chapter, except that fill-in pieces are not required when outer flaps have full overlap. Outer flaps must butt or have full overlap.

(c) In lieu of fill-in pieces between inner flaps which do not butt, the following is authorized when linings are not prescribed in § 178.205-16.

(1) Top and bottom pads the same dimensions as interior of container of solid or corrugated fiberboard at least 125 pound test (Mullen or Cady).

(2) Minimum combined weight of facings for corrugated fiberboard pads must be at least 52 pounds per thousand square feet.

(3) Minimum combined weight of component plies for solid fiberboard pads must be at least 114 pounds per thousand square feet, exclusive of adhesives.

(4) Complete inner box or boxes.

(d) Single-flap closures are authorized for boxes with one dimension not over 2'; each flap must be scored and form one of the small faces of the box and lap at least 5" on one of the largest faces.

§ 178.205-15 Linings (when prescribed by § 178.205-16).

(a) Of 1-piece to extend around 4 faces with joint at center of 1 face and with 4 flanges, at least $1\frac{1}{2}$ " long, on each end (corners may be mitered) to bend over the other 2 faces; also 2 pads to cover the other 2 faces. Pads may be omitted if closing flaps afford 3 thicknesses throughout face. For boxes with 1 dimension not over 3', one of the widest flanges may be lengthened to cover entire face and lap 6" on the adjoining

face and the other flanges and the pads may then be omitted.

§ 178.205-16 Authorized gross weight and parts required.

(a) Authorized gross weight (when packed) and parts required as follows:

Authorized gross weight (pounds)	Strength of fiberboard (minimum) Mullen or Cady test					
	Solid board			Double-faced corrugated		Double wall corrugated
	Box	Lining ²	Heads ¹	Box	Lining ²	Box Lining ²
15.....	175	-----	(³)	175	-----	200
30.....	200	-----	275	200	-----	200
40.....	275	-----	350	275	-----	200
55.....	325	-----	(³)	325	-----	275
65 ⁴	375	-----	(³)	375	-----	275
	275	175	350	200	200	275

¹ For recessed heads when used. In other cases same as for box.

² As prescribed in § 178.205-15. A complete box is acceptable in place of the lining.

³ Recessed heads not authorized in any case.

⁴ Except as otherwise authorized herein or by Part 173 of this chapter.

(b) Triple slide boxes authorized for gross weights as follows: Of board at least 175-pound test for 40 pounds; of board at least 200-pound test for 65 pounds.

§ 178.205-17 Closing for shipment.

(a) Slotted container, by coating with adhesive the entire contact surfaces of closing flaps and fill-in pieces where required or as prescribed in subparagraph (1), (2), or (3) of this paragraph.

(1) By stitching with staples as prescribed by § 178.205-6 at 2½-inch intervals along all seams (one 5-inch space allowed when necessary to permit use of stitching device); or with staples made of flat wire of hardness not less than equivalent of Rockwell B90, and not less than 0.037 inch thick and not less than 0.074 inch wide, with not less than 1¼ inch crown, may be spaced not more than 5 inches apart. Such staples may be used across center seam where outside flaps meet in lieu of on both sides of center seam but need only be used where outside flaps overlay inner flaps; or staples made of arcuate wire of hardness not less than equivalent of Rockwell B90,

and not less than 0.027 inch thick and not less than 0.095 inch wide, with not less than 1 inch crown, may be spaced not more than 5 inches apart. Such stitches when spaced not more than 2½ inches apart may be used across center seam where outside flaps meet in lieu of on both sides of center seam but need only be used where outside flaps overlay inner flaps.

(2) For fiberboard boxes containing not more than 1 inside metal can not exceeding 1 gallon nominal capacity, and as otherwise authorized by Part 173 of this chapter, by application of 2 strips of pressure-sensitive tape not less than ½ inch in width, 1 strip to be placed approximately equal distance over the seam of abutting outer flaps, the other at a right angle to the first and spaced approximately equal distance on the closure face; strips must be of sufficient length to extend not less than 1 inch beyond score lines on side and end panels. Tape shall have a minimum tensile strength of 160 pounds per inch of width; minimum adhesion value of 18 ounces per inch of width; and minimum elongation of 12 percent at break, or having a minimum longitudinal tensile strength of not less than 240 pounds per inch of width; minimum adhesion value of 18 ounces per inch of width and a minimum elongation of 3 percent at break.

(3) For slotted containers only, reinforced tape complying with the requirements of § 178.205-7(b) is authorized for application over the center seam only. Tape must extend over the ends of box not less than 2½ inches.

(b) Double slide boxes or triple slide boxes, by coating the inner slides with adhesive, or by closing with reinforced tape capable of withstanding test prescribed by subparagraph (1) of this paragraph; for single-flap closures as authorized for boxes with one dimension not over 2 inches, the flaps must be fastened to the body with adhesive.

(1) Boxes selected at random, containing dummy contents similar to that to be shipped and packed to authorized gross weight, closed with reinforced tape across the ends and onto opposite side panels at least 2 inches, must be capable of withstanding a drop on each end from a height of 4 feet onto solid concrete without closure failure.

(c) Fiberboard boxes with covers extending over sides but not to bottom,

covers resting on walls of box, or telescope boxes of equal depth section, covers extending to bottom, must be secured by one of the following methods:

(1) By not less than three metal straps, one lengthwise and others at right angles thereto.

(2) When cover extends not less than 3 inches over the walls of the box, by coating with adhesive the entire contact area of the cover.

(3) Telescope boxes having equal depth sections may be closed by application of reinforced water activated tape or pressure sensitive tape under conditions and for commodities as prescribed in Part 173 of this chapter.

(d) When metal straps are specified, boxes must be strapped with the required number; size at least $\frac{3}{4}$ inch x 0.015 inch.

§ 178.205-18 Marking.

(a) *On each container.* Symbol in rectangle as follows:

DOT-12B***

(1) Stars to be replaced by authorized gross weight (for example, DOT-12B40, etc.).

(2) Name and address or symbol of person making the mark specified in paragraph (a)(1) of this section and located just above or below that mark. Symbol, if used, must be registered with the Bureau of Explosives.

(3) When metal straps are prescribed, boxes must be marked "-----

(number) METAL STRAPS REQUIRED" just above or below the mark specified in this paragraph.

(4) Size of markings: Specification markings prescribed in subparagraph (1) of this paragraph must be at least $\frac{1}{2}$ inch high; other markings must be legible.

§ 178.205-19 Special box; authorized only for contents in 1-gallon rectangular metal cans or cylindrical metal cans of 26 gauge material.

(a) Must comply with this specification except as follows: Must be 1-piece type, of double-wall corrugated fiberboard at least 400-pound test with all three facings at least 135-pound test; to be marked "FOR 1-GAL. CYLINDRICAL OR RECTANGULAR CANS ONLY" near

the I.C.C. specification mark; authorized gross weight 84 pounds.

§ 178.205-20 Special box; authorized only for proxylin in sheets, rods, or tubes.

(a) Must comply with this specification except as follows: Must be of board at least 275-pound test with lining at least 200-pound test, all being double-faced corrugated fiberboard; 3 metal straps required (see §§ 178.205-17 and 178.205-18); authorized gross weight 90 pounds.

§ 178.205-21 Special box; authorized only for proxylin in sheets, rods, or tubes.

(a) Must comply with this specification except as follows: Must be telescope type with wooden frame between the parts that telescope; authorized gross weight 90 pounds.

(b) Frame of group 3 or 4 wood $\frac{3}{16}$ " thick with lock corners glued.

GROUP 3

White elm.	Black gum.
Red gum.	Black ash.
Sycamore.	Tupelo.
Pumpkin ash.	Maple—soft or silver.

GROUP 4

Hard maple.	Birch.
Beech.	Rock elm.
Oak.	Hickory.
Hackberry.	White ash.

(c) Telescoping parts of double-faced corrugated fiberboard at least 400-pound test with facings at least 180 pounds per thousand square feet; each part of same depth as frame; outer part to have corners overlapped and securely fastened.

(d) Four metal straps required. Glued or stitched closure not required. (See §§ 178.205-17 and 178-205-18.)

§ 178.205-22 Special box; authorized only for motion-picture film in metal cans or strong cardboard or fiberboard boxes each containing not over 2,000 feet (approx.) of film.

(a) Must comply with this specification except as follows:

(1) *For one inside container.* Must be of board at least 275-pound test for a 2,000-foot film and of board at least 200-pound test for a 1,000-foot film; lining and pads not required; closure by taping with strong paper tape authorized.

(2) *For more than one inside container.* Must be of 1-piece type; authorized gross weight 55 pounds when made

of 325-pound test board, 65 pounds when made of 375-pound test board, and 75 pounds when made of 450-pound test board; interior packing required, of fiberboard at least 175-pound test, adequate to support inside containers in center of outside container; lining and top and bottom pads not required.

§ 178.205-23 Special box; authorized only for poisonous solids, class B, in 1-gallon metal cans.

(a) Must comply with this specification except as follows: Must be 1-piece type, of double-wall corrugated fiberboard at least 400-pound test with all three facings at least 135-pound test; authorized gross weight 84 pounds.

§ 178.205-24 Special box; authorized only for fusees.

(a) Must comply with this specification except that the box must be constructed of double faced corrugated fiberboard at least 400-pound test or solid fiberboard of same strength. Lining and pads are not required. Authorized gross weight is 75 pounds. For fusees equipped with spikes, box-end protection as required in § 173.154a(a)(2) of this chapter must be provided.

§ 178.205-25 Special box; authorized only for wet electric storage batteries of the glass cell type or synthetic resin (plastic) type.

(a) Must comply with this specification except as follows: Must be one-piece type of double wall corrugated fiberboard at least 275-pound test; must have linings to extend around four faces with joint in center of or at end of one face but at no time may joint of box and joint of liner coincide; lining to be of sufficient height to support vertical scoring of box; lining to be made of double wall corrugated board with minimum test of 275 pounds, top of battery or batteries to be protected by trays or scored sheets of corrugated fiberboard having minimum test of 200 pounds; bottom of batteries to be protected by minimum of one excelsior pad or one double wall corrugated fiberboard pad; when one or more batteries are packed in same carton, batteries must be separated by a minimum of one thickness of double wall corrugated fiberboard having minimum test of 275 pounds; authorized gross weight 95 pounds.

§ 178.205-26 Special box; authorized only for one 5-gallon rectangular metal can, spec. 2F (§ 178.25 of this part); gross weight not to exceed 65 pounds.

(a) Must comply with this specification except as follows: Must be 1-piece type of double-wall corrugated fiberboard at least 350-pound test; must have top and bottom pads of double-wall corrugated fiberboard at least 350-pound test, pads to be double-flanged with flanges extending down the inside of carton at least four inches.

§ 178.205-27 Special box; authorized only for not more than two square inside metal cans each containing not over 200 feet (approx.) motion-picture film; gross weight not to exceed 15 pounds.

(a) Must comply with this specification except as follows: Must be double-slide type, both slides of double-faced corrugated fiberboard at least 200-pound test; closure by taping with strong paper tape authorized.

§ 178.205-28 Special box; authorized only for wet electric storage batteries of aluminum-case type, asphaltum composition, impregnated rubber, synthetic resin (plastic), or wooden-battery-box type, having a net weight greater than 75 pounds.

(a) Must comply with this specification except as follows: Must be one-piece type of double wall corrugated fiberboard at least 400-pound test, or solid fiberboard testing at least 400 pounds, boxes may or may not have hand holes provided for in ends of box providing same will not materially weaken box, top of battery to be protected by wood frame, corrugated trays or scored sheets of corrugated fiberboard having minimum test of 200 pounds, top protection must bear evenly on connectors of battery to facilitate stacking of batteries, bottom of batteries to be protected by minimum of one excelsior pad or double wall corrugated fiberboard pad; sides and ends to be cushioned between batteries and walls of box; combined thickness of cushioning material and walls of box must be not less than $\frac{1}{2}$ ", cushioning to be of excelsior pads, corrugated fiberboard or other suitable cushioning material; no more than one battery to be packed per box, authorized gross weight 190 pounds.

§ 178.205-29 **Special box: authorized only for ship distress signals in inside metal containers of not less than 24 gauge metal.**

(a) Must comply with this specification except as follows: Must be one-piece type of double faced corrugated board at least 350-pound test, with top and bottom pads of the same material. Gross weight not to exceed 95 pounds.

§ 178.205-30 **Special box: authorized only for toy torpedoes.**

(a) Must comply with this specification and the following: Must be one-piece type fabricated of double-wall corrugated fiberboard having minimum strength of 350 pounds per square inch, Mullen or Cady test. Box shall be provided with double-face lining on all sides and top and bottom pads. Gross weight not to exceed 25 pounds.

§ 178.205-31 **Special box: authorized only for commodities where spec. 12B is prescribed in Part 173 of this chapter.**

(a) Box shall have not more than 1 inside glass container having screw cap closure or metal container not exceeding 32 ounces or 2 pounds net weight, which must fit snugly or be adequately cushioned to prevent movement. Box shall comply with this specification and be of one-piece folder type, so designed as to form double thickness of corrugated board on top, bottom, and ends. Fiberboard used in construction of the box shall have a minimum strength of 200 pounds per square inch, but for gross weight exceeding 8 pounds, the box must be constructed of at least 275-pound per square inch test fiberboard (Mullen or Cady). Closure must be equal in efficiency to that prescribed in § 178.205-17.

§ 178.205-32 **Special box: authorized only for electrolyte (acid), corrosive battery fluid, hydrochloric acid mixtures of not over 28 percent strength, or cleaning compounds, liquids, containing not over 28 percent hydrochloric (muriatic) acid.**

(a) Box shall have not more than 12 inside glass bottles, with acid-proof closures, of not over 32 ounces capacity each. Box shall comply with this specification and be constructed of at least 275-pound test (Mullen or Cady) double-wall corrugated fiberboard and be equipped with at least 125-pound test

(Mullen or Cady) double-faced corrugated fiberboard scored sheets so designed as to provide two thicknesses of corrugated fiberboard between each bottle and one thickness between bottles and sides and ends of box. Top and bottom pads of the same size as the top and bottom area of the box and of at least 125-pound test (Mullen or Cady) double-faced corrugated board are required or box shall comply with this specification and be constructed of at least 325-pound test (Mullen or Cady) double-faced corrugated board and be equipped with at least 200-pound test (Mullen or Cady) corrugated fiberboard $\frac{1}{2}$ inch extended cell slotted partitions so designed as to provide a void space between the ends and sides of outside box and the inside cell partition and shall be provided with top and bottom pads, of the same area as the box, of at least 200-pound test (Mullen or Cady) double-faced corrugated fiberboard.

§ 178.205-33 **Special box: authorized only for electrolyte (acid) and alkaline corrosive battery fluid packed with storage batteries.**

(a) Box shall be constructed of corrugated fiberboard having strength of not less than 200 pounds per square inch. Mullen or Cady test for maximum authorized gross weight not over 65 pounds. Top and bottom pads and fill-in pieces are not required when inner flaps do not meet. Box must otherwise comply with this specification. (See § 173.258(a)(3) of this chapter.)

§ 178.205-34 **Special box: authorized only for a polyethylene, or other suitable plastic, tight-fitting inside container having a minimum wall thickness of 0.015 inch and so designed as to maintain its configuration when standing empty and open.**

(a) Box shall comply with this specification except that top of box shall be closed by means of slotted flaps so arranged as to provide protection for the neck of the inside container and be fitted with fill-in pieces as necessary; equally efficient closures and container neck protectors are authorized. Complete package, closed as for shipment with inside container filled to rated capacity with water must be capable of withstanding 2 drops from a height of 4 feet onto solid concrete without leakage or serious rup-

ture of box. Authorized gross weight not over 65 pounds.

§ 178.205-35 Special box; authorized only for aircraft type wet electric storage batteries.

(a) Box shall comply with this specification and shall be constructed of at least 275-pound test double-faced corrugated fiberboard. Inside corrugated fiberboard cushioning shall be provided as necessary to prevent short-circuits, breakage under normal conditions of transportation, and superimposed weights on links, covers, or other parts weaker than the battery case. Not more than one wet electric storage battery shall be packed in a box and gross weight shall not exceed 85 pounds.

§ 178.205-36 Special box; authorized only for an inside polyethylene container, spec. DOT-2U (§ 178.24 of this chapter), not over 5 gallons capacity.

(a) Box shall comply with this specification except as provided herein, and shall have glued closure flaps only. Inner and outer top closure flaps may have suitably sized holes for access to the closure of the polyethylene container. The diameter of these holes must be less than the diameter of a metal plate inserted between the flaps to which polyethylene closure shall be attached.

§ 178.205-37 Special box; authorized polyethylene or other suitable plastic bags for packaging of electrolyte (acid) or alkaline corrosive battery fluid only.

(a) Box shall comply with this specification except as follows: Box must be one-piece construction of slotted style and may have die-cut areas of minimum size to provide access to an inside closure part. Box must contain one multiwall bag made of polyethylene or other suitable plastic of sufficient size and capacity to be capable of coming into contact with all of the interior surfaces of the box when filled. Each ply of the bag must be formed from virgin film not less than 0.003 inch thick. Joints must be heat sealed and not less than $\frac{1}{8}$ -inch wide.

(b) Boxes must be center special slotted style, or regular slotted style. If any metal is used in the box construction, full liners and top and bottom pads are required. Any metal closure for a

discharge tube must be installed so as to prevent contact with the polyethylene bag. Discharge tubes must be plugged or heat sealed. Maximum volumetric capacity must not exceed 5 gallons (nominal).

(1) For boxes having capacities of 6 quarts (nominal) or less, fiberboard of at least 200-pound test is required for construction.

(2) For boxes having capacities in excess of 6 quarts, fiberboard of at least 350-pound test is required. Pads are required for regular slotted style boxes and must be of fiberboard of at least 350-pound test or other material that will provide equivalent protection.

(c) Representative samples of completely assembled boxes, with all parts closed as for shipment, must be capable of withstanding the following tests without leakage or serious damage to boxes. No one box shall be expected to withstand more than one of the following tests:

(1) Box with inside container filled to shipping capacity with a solution which is compatible with the plastic bags, must be dropped twice from a height of 4 feet onto concrete, one drop to be made with the box positioned so as to strike flat on the box bottom, the other drop to be made so box will strike flat on the largest face.

(2) Box with inside container filled to shipping capacity with a solution which is compatible with the plastic bags, and remains liquid at 0° F. or lower shall be dropped once from a height of 4 feet onto concrete, when container and contents are at or below 0° F. Box shall be positioned so as to strike flat on the box bottom.

(3) Box with inside container filled as prescribed in subparagraph (1) of this paragraph shall be capable of withstanding a vibration test by placing the container on the vibration table anchored in such manner that all horizontal motion shall be restricted and only vertical motion allowed. The test shall be performed for one hour using an amplitude of one inch at a frequency that causes the test container to be raised from the floor of the table to such a degree that a piece of paper or flat steel strap or tape can be passed between the table and the container.

(d) Tests to be conducted by or for each plant assembling and filling boxes at the initial start of production and must be repeated at intervals of four months thereafter; initial tests must be

witnessed by a representative of the Bureau of Explosives. Samples last tested must be dated with date of test and must be retained until subsequent tests are conducted. Empty boxes with liners may be shipped to a central point for assembling, filling and testing in which case the Bureau of Explosives must be advised of test location.

§ 178.206 Specification 12C: fiberboard boxes.

§ 178.206-1 Compliance.

(a) Required in all details.

§ 178.206-2 Definitions.

(a) Terms such as "200-pound test" mean minimum strength, Mullen or Cady test.

(b) "Joints" are where edges of parts of box, except recessed flanged heads, are connected together in setting up the box. Generally done by box maker.

(c) "Seams" are where edges of parts of box are visible, except joints, when box is closed.

§ 178.206-3 Classification of board.

(a) Fiberboard is hereby classified by strength of completed board as in first column of the following table; weights specified in the table are the minimums authorized.

Classified strength ¹ of completed board	Solid fiberboard—Minimum combined weight of component plies exclusive of adhesives (pounds per 1,000 sq. ft.)	Facings for corrugated fiberboard	
		Double faced—Minimum combined weight of facings (pounds per 1,000 sq. ft.)	Double wall—Minimum combined weight of facings including center liner (pounds per 1,000 sq. ft.)
175.....	149	75	
200.....	190	84	92
275.....	237	138	110
350.....	283	180	126

¹ Mullen or Cady test (minimum)

§ 178.206-4 Solid fiberboard.

(a) To be 3-ply or more; both outer plies water resistant.

§ 178.206-5 Corrugated fiberboard.

(a) Both outer facings water resistant; corrugated sheets must be at least

0.009 inch thick and weight not less than 26 pounds per 1000 square feet; all parts must be securely glued together throughout all contact areas.

§ 178.206-6 Stitching staples.

Stitching staples must be made in such a configuration that their holding capability as installed will not be less than that of flat steel staples $\frac{3}{32}$ x 0.019 inch in cross section and not less than $\frac{7}{16}$ -inch wide.

§ 178.206-7 Tape.

(a) Coated with glue at least equal to No. 1 $\frac{3}{4}$ Peter Cooper standard. Cloth tape of strength, across woof, at least 70 units, Elmendorf test. Sisal tape of 2 sheets of No. 1 Kraft paper, total weight 80 pounds per ream (500 sheets, 24 x 36 inches); sheets to be combined with asphalt and reinforced by unspun sisal fibers completely embedded in the asphalt and extending across the tape, except as provided in § 178.206-11(d).

(b) Tape for closure of slotted containers complying with the following requirements is authorized when applied as prescribed in § 178.206-17 (a) (2):

(1) Tape must be not less than 3 inches wide and shall be made of two sheets of 100 percent sulfate Kraft each not less than 30 pounds basis weight, reinforced with glass, sisal, or rayon fiber, combined with a laminant of asphalt or other material not affected by temperature extremes any more than would standard 180° to 200° softening point asphalt.

(2) Tape must be reinforced by lengthwise fibers spaced not more than an average of $\frac{1}{2}$ inch apart, and by crosswise fibers spaced not less than an average of 2 per inch except that when a diamond pattern is employed for crosswise reinforcement, the spacing between the parallel sides of the diamond measured in the machine direction must be not more than 1 inch.

(3) Glass or sisal reinforced tape must have a minimum tensile strength in the machine direction of 75 pounds per inch of width and a minimum tensile strength in the cross direction of 45 pounds per inch of width; rayon reinforced tape must have a minimum tensile strength in the machine direction of 57 pounds per inch of width and a minimum tensile strength in the cross direction of 27 pounds per inch of width with elongation not exceeding 15 percent. Tensile tests

on the finished product shall be made on a 3-inch width sample.

§ 178.206-8 Test.

(a) Acceptable board must have prescribed strength, Mullen or Cady test, after exposure for at least 3 hours to normal atmospheric conditions (50 to 70 percent relative humidity), under test as follows:

(1) Clamp board firmly in machine and turn wheel thereof at constant speed of approximately 2 revolutions per second.

(2) Six punctures required, 3 from each side; all results but one must show prescribed strength.

(3) Board failing may be retested by making 24 punctures, 12 from each side; when all results but 4 show prescribed strength the board is acceptable.

(4) For corrugated fiberboard, double-pop tests may be disregarded.

§ 178.206-9 Types authorized.

(a) To be of solid or corrugated fiberboard of the following types:

(1) Slotted box: three-piece box without recessed ends; three-piece box of solid fiberboard with recessed ends; double-slide box; triple-slide box; telescope box, with sections of equal depth or with covers, top or bottom or both, with 3-inch overlap. (See § 178.206-14 (d) for boxes with single-flap closures.)

§ 178.206-10 Forming.

(a) Parts must be cut true to size and so creased and slotted as to fit closely into position without cracking, surface breaks, separation of parts outside of crease, or undue binding.

§ 178.206-11 Joints.

(a) For solid and corrugated fiberboard slotted containers: Lapped $1\frac{1}{2}$ inches from center of scoreline except as in § 178.206-12; stitched at $2\frac{1}{2}$ inch intervals and within 1 inch of each end of joint; body joint must be double-stitched (2 parallel stitches) at each end of joint over 18 inches long.

(b) For corrugated fiberboard slotted containers only: One butt joint taped (See § 178.206-7) is authorized; 3 inch tape requested for boxes over 30 pounds authorized gross weight and 2 inch tape for others.

(c) For triple and double slide boxes: Joints of all slides must be taped (See § 178.206-7) or stitched.

(d) For corrugated fiberboard only: One butt joint taped inside and outside with strips of one thickness of sulphate paper not less than 2 inches wide extending entire length of joint and firmly glued to box. For boxes not exceeding 65 pounds gross weight, outside strip of sulphate paper to be of basis weight not less than 60 pounds testing not less than 60 pounds and inside strip of sulphate paper to be of basis weight not less than 40 pounds testing not less than 40 pounds. For boxes exceeding 65 pounds gross weight, outside and inside with strips of sulphate paper which must each be of basis weight not less than 90 pounds testing not less than 90 pounds. Basis weight of paper shown is 500 sheets, 24 x 36 inches.

(1) For glued lap joint, the sides of box forming joint must lap not less than $1\frac{1}{4}$ " and be firmly glued throughout entire area of contact with a glue or adhesive which cannot be dissolved in water after the film application has dried.

§ 178.206-12 Flanged heads.

(a) Must have 4 flanges, at least 1" long above fillet, on each head. Recessed flanged heads not authorized for boxes of corrugated fiberboard.

§ 178.206-13 Seams which are to be stitched.

(a) Overlap, if any, required to be at least $1\frac{1}{2}$ inches from center of scoreline except as in § 178.206-12.

§ 178.206-14 Flap closures.

(a) Fill-in pieces, of the same type fiberboard as used in construction of the container, are required where it is necessary to prevent an opening between the inner flaps, unless otherwise provided by Part 173 of this chapter.

(b) If to be closed by adhesive, each inner flap must cover at least one-third of face; inner flaps must butt or have full overlap, or fill-in pieces must be used unless otherwise provided by Part 173 of this chapter, except that fill-in pieces are not required when outer flaps have full overlap. Outer flaps must be reasonably close together at the center seam or have full overlap.

(c) In lieu of fill-in pieces between inner flaps which do not butt, the following is authorized when linings are not prescribed in § 178.206-16:

(1) Top and bottom pads the same dimensions as interior of container of solid or corrugated fiberboard at least 125 pounds test (Mullen or Cady).

(2) Minimum combined weight of facings of corrugated fiberboard pads must be at least 52 pounds per thousand square feet.

(3) Minimum combined weight of component plies for solid fiberboard pads must be at least 114 pounds per thousand square feet, exclusive of adhesives.

(4) Complete inner box or boxes.

(d) Single-flap closures are authorized for boxes with one dimension not over 2'; each flap must be scored and form one of the small faces of the box and lap at least 5' on one of the largest faces.

§ 178.206-15 Linings (when prescribed).

(a) Of 1 piece to extend around 4 faces with joint at center of 1 face and with 4 flanges, at least 1½' long, on each end (corners may be mitered) to bend over the other 2 faces; also 2 pads to cover the other 2 faces. Pads may be omitted if closing flaps afford 3 thicknesses throughout face. For boxes with 1 dimension not over 3', one of the widest flanges may be lengthened to cover entire face and lap 6' on the adjoining face and the other flanges and the pads may then be omitted.

§ 178.206-16 Authorized gross weight and parts required.

(a) Authorized gross weight (when packed) and parts required as follows:

Authorized gross weight (pounds)	Strength of fiberboard (minimum) Mullen or Cady test						
	Solid board			Double-faced corrugated		Double wall corrugated	
	Box	Lining ¹	Heads ¹	Box	Lining ²	Box	Lining ²
30.....	175	-----	200	175	-----	200	-----
40.....	200	-----	275	200	-----	200	-----
65 ⁴	275	-----	350	275	-----	275	-----
				200	175		

¹ For recessed heads when used. In other cases same as for box.

² As prescribed in § 178.206-15. A complete box is acceptable in place of the lining.

³ Facings at least 138 pounds per thousand square feet or inner facing at least 42 pounds and outer facing at least 90 pounds per thousand square feet.

⁴ Except as otherwise authorized by Part 173 of this chapter.

(b) Triple slide boxes of double-faced corrugated fiberboard of at least 175-pound test are also authorized for 65 pounds gross weight.

§ 178.206-17 Closing for shipment.

(a) Slotted container, by coating with adhesive the entire contact surfaces of closing flaps and fill-in pieces where required or as prescribed in subparagraph (1), (2), or (3) of this paragraph.

(1) By stitching with staples as prescribed by § 178.206-6 at 2½-inch intervals along all seams (one 5-inch space allowed when necessary to permit use of stitching device); or with staples made of flat wire of hardness not less than equivalent of Rockwell B90, and not less than 0.037 inch thick and not less than 0.074 inch wide, with not less than 1¼-inch crown, may be spaced not more than 5 inches apart. Such staples may be used across center seam where outside flaps meet in lieu of on both sides of center seam but need only be used where outside flaps overlay inner flaps; or staples made of arcuate wire of hardness not less than equivalent of Rockwell B90, and not less than 0.027 inch thick and not less than 0.095 inch wide, with not less than 1 inch crown, may be spaced not more than 5 inches apart. Such stitches when spaced not more than 2½ inches apart may be used across center seam where outside flaps meet in lieu of on both sides of center seam but need only be used where outside flaps overlap inner flaps.

(2) For fiberboard boxes containing not more than 1 inside metal can not exceeding 1 gallon nominal capacity, by application of 2 strips of pressure-sensitive tape not less than ½ inch in width, 1 strip to be placed approximately equal distance over the seam of abutting outer flaps, the other at a right angle to the first and spaced approximately equal distance on the closure face; strips must be of sufficient length to extend not less than 1 inch beyond score lines on side and end panels. Tape shall have a minimum tensile strength of 160 pounds per inch of width; minimum adhesion value of 18 ounces per inch of width; and minimum elongation of 12 percent at break, or having a minimum longitudinal tensile strength of not less than 240 pounds per inch of width; minimum adhesion value of 18 ounces per inch of width and

a minimum elongation of 3 percent at break.

(3) For slotted containers only, reinforced tape complying with the requirements of § 178.206-7 (b) is authorized for application over the center seam only. Tape must extend over the ends of box not less than 2½ inches.

(b) Double slide boxes or triple slide boxes, by coating with adhesive the inner slides: for single-flap closures as authorized for boxes with one dimension not over 2 inches, the flaps must be fastened to the body with adhesive.

(c) Fiberboard boxes with covers extending over sides but not to bottom, covers resting on walls of box, or telescope boxes of equal depth section, covers extending to bottom, must be secured by one of the following methods:

(1) By not less than three metal straps, one lengthwise and others at right angles thereto.

(2) When cover extends not less than 3 inches over the walls of the box, by coating with adhesive the entire contact area of the cover.

(d) When metal straps are specified, boxes must be strapped with the required number; size at least ⅜ inch x 0.015 inch.

§ 178.206-18 Marking.

(a) On each container. Symbol in rectangle as follows:

DOT-12C***

(1) Stars to be replaced by authorized gross weight (for example, DOT-12C65, etc.).

(2) Name and address or symbol of person making the mark specified in paragraph (a)(1) of this section and located just above or below that mark. Symbol, if used, must be registered with the Bureau of Explosives.

(3) When metal straps are prescribed boxes must be marked "----- (number) METAL STRAPS REQUIRED" just above or below the mark specified in this paragraph.

(4) Size of markings: Specification markings prescribed in subparagraph (1) of this paragraph must be at least ½ inch high; other markings must be legible.

§ 178.206-19 Special box: authorized only for polyethylene, or other suitable plastic, tight-fitting inside containers having minimum wall thickness of 0.015 inch and so designed as to maintain their configuration when standing empty and open.

(a) Box shall comply with this specification except that top of box shall be closed by means of slotted flaps so arranged as to provide protection for the neck of the inside container and be fitted with fill-in pieces as necessary. Top may have die-cut area of suitable size to provide for easy opening. Complete package, closed as for shipment, with inside container filled to rated capacity with water, must be capable of withstanding 2 drops from a height of 4 feet onto solid concrete without leakage or serious rupture of box. Authorized gross weight not over 65 pounds. (See § 173.257(a)(6) of this chapter.)

§ 178.207 Specification 12D; fiberboard boxes.

§ 178.207-1 Compliance.

(a) Required in all details.

§ 178.207-2 Definitions.

(a) Terms such as "200-pound test" mean minimum strength, Mullen or Cady test.

(b) "Joints" are where edges of parts of box are connected together in setting up the box. Generally done by box maker.

(c) "Seams" are where edges of parts of box are visible, except joints, when box is closed.

§ 178.207-3 Classification of board.

(a) Fiberboard is hereby classified by strength of completed board as in first column of the following table; weights specified in the table are the minimums authorized.

Classified strength ¹ of completed board	Facings for double-wall corrugated fiberboard—Minimum combined weight of facings including center liner (pounds per 1,000 sq. ft.)
275 ----- 350 -----	110 126

¹ Mullen or Cady test (minimum).

§ 178.207-4 Corrugated fiberboard.

(a) Both outer facings water resistant; corrugated sheets at least 0.009" thick and weigh not less than 26 pounds per 1000 square feet; all parts securely glued together throughout all contact areas.

§ 178.207-5 Stitching staples.

Stitching staples must be made in such a configuration that their holding capability as installed will not be less than that of flat steel staples $\frac{3}{32}$ x 0.019 inch in cross section and not less than $\frac{7}{16}$ -inch wide.

§ 178.207-6 Tape.

(a) Coated with glue at least equal to No. 1 $\frac{3}{4}$ Peter Cooper standard. Cloth tape of strength, across the width, at least 70 units, Elmerdorf test. Sisal tape of 2 sheets of No. 1 Kraft paper, total weight 80 pounds per ream (500 sheets, 24" x 36"); sheets to be combined with asphalt and reinforced by unspun sisal fibers completely embedded in the asphalt and extending across the tape, except as provided in § 178.207-10(d).

(b) Tape for closure of slotted containers complying with the following requirements is authorized when applied as prescribed in § 178.207-17(a)(3):

(1) Tape must be not less than 3 inches wide and shall be made of two sheets of 100 percent sulfate Kraft each not less than 30 pounds basis weight, reinforced with glass, sisal, or rayon fiber combined with a laminant of asphalt or other material not affected by temperature extremes any more than would standard 180° to 200° softening point asphalt.

(2) Tape must be reinforced by lengthwise fibers spaced not more than an average of $\frac{1}{2}$ inch apart, and by crosswise fibers spaced not less than an average of 2 per inch except that when a diamond pattern is employed for crosswise reinforcement, the spacing between the parallel sides of the diamond measured in the machine direction must be not more than 1 inch.

(3) Glass or sisal reinforced tape must have a minimum tensile strength in the machine direction of 75 pounds per inch of width and a minimum tensile strength in the cross direction of 45 pounds per

inch of width; rayon reinforced tape must have a minimum tensile strength in the machine direction of 57 pounds per inch of width, and a minimum tensile strength in the cross direction of 27 pounds per inch of width with elongation not exceeding 15 percent. Tensile tests on the finished product shall be made on a 3-inch width sample.

§ 178.207-7 Test.

(a) Acceptable board must have prescribed strength, Mullen or Cady test, after exposure for at least 3 hours to normal atmospheric conditions (50 to 70 percent relative humidity), under test as follows:

(1) Clamp board firmly in machine and turn wheel thereof at constant speed of approximately 2 revolutions per second.

(2) Six punctures required, 3 from each side; all results but one must show prescribed strength.

(3) Board failing may be retested by making 24 punctures 12 from each side, when all results but 4 show prescribed strength the board is acceptable.

(4) Double-pop tests may be disregarded.

§ 178.207-8 Types authorized.

(a) To be of double-wall corrugated fiberboard of the following types:

(1) Slotted box; three piece box without recessed ends; double-slide box; triple-slide box; telescope box, with sections of equal depth, or with covers, top or bottom or both, with 3 inch overlap.

§ 178.207-9 Forming.

(a) Parts must be cut true to size and so creased and slotted as to fit closely into position without cracking, surface breaks, separation of parts outside of crease, or undue binding.

§ 178.207-10 Joints.

(a) For slotted container: Lapped $1\frac{1}{2}$ inches from center of scoreline except as in § 178.207-11; stitched at $2\frac{1}{2}$ -inch intervals and within 1 inch of each end of joint; body joint must be double-stitched (2 parallel stitches) at each end of joint over 18 inches long.

(b) For slotted containers only: One butt joint taped (See § 178.207-6) is authorized; 3 inch tape required.

(c) For triple and double slide boxes: Joints of all slides must be taped (See § 178.207-6) or stitched.

(d) One butt joint taped inside and outside with strips of one thickness of sulphate paper not less than 2 inches wide extending entire length of joint and firmly glued to box. For boxes not exceeding 65 pounds gross weight, outside strip of sulphate paper to be of basis weight not less than 60 pounds testing not less than 60 pounds and inside strip of sulphate paper to be of basis weight not less than 40 pounds testing, not less than 40 pounds. For boxes exceeding 65 pound gross weight, outside and inside with strips of sulphate paper which must each be of basis weight not less than 90 pounds testing not less than 90 pounds. Basis weight of paper shown is for 500 sheets, 24 x 36 inches.

(1) For glued lap joint, the sides of box forming joint must lap not less than $1\frac{1}{4}$ " and be firmly glued throughout entire area of contact with a glue or adhesive which cannot be dissolved in water after the film application has dried.

§ 178.207-11 Flanged heads.

(a) Must have 4 flanges, at least 1" long above fillet, on each head. Recessed flanged heads not authorized.

§ 178.207-12 Seams which are to be stitched.

(a) Overlap, if any, required to be at least $1\frac{1}{2}$ inches from center of scoreline except as in § 178.207-11.

§ 178.207-13 Flap closures.

(a) Fill-in pieces, of the same type fiberboard as used in construction of the container, are required where it is necessary to prevent an opening between the inner flaps.

(b) If to be closed by adhesive, each inner flap must cover at least $\frac{1}{2}$ of face, inner flaps must butt or have full overlap, or fill-in pieces must be used; except that fill in pieces are not required when outer flaps have full overlap. Outer flaps must butt or have full overlap.

§ 178.207-14 Linings (when prescribed).

(a) Of 1 piece to extend around 4 faces with joint at center of 1 face and with 4 flanges, at least $1\frac{1}{2}$ " long, on each end (corners may be mitered) to bend over the other 2 faces; also 2 pads to cover the other 2 faces. Pads may be omitted if closing flaps afford 3 thicknesses throughout face. For boxes with 1 dimension not over 3", one of the widest

flanges may be lengthened to cover entire face and lap 6" on the adjoining face and the other flanges and the pads may then be omitted.

§ 178.207-15 Authorized gross weight and parts required.

(a) Authorized gross weight (when packed) and parts required as follows:

(1) For authorized gross weight not over 25 pounds, box must be constructed of at least 275-pound test double-wall corrugated fiberboard with liners and top and bottom pads, or a complete inner box, of same material.

(2) For authorized gross weight over 25 pounds but not exceeding 75 pounds, inside containers must be packed in boxes of at least 275-pound test double-wall corrugated fiberboard and these packages packed in an outside box of at least 350-pound test double-wall corrugated fiberboard.

§ 178.207-16 Test for completed package.

(a) The completed packages closed as for shipment must be capable of withstanding a drop of 4 feet to solid concrete without breakage of the inside containers.

§ 178.207-17 Closing for shipment.

(a) Slotted container, by coating with adhesive the entire contact surfaces of closing flaps and fill-in pieces, or as prescribed in subparagraphs (1), (2), or (3) of this paragraph.

(1) By stitching at $2\frac{1}{2}$ -inch intervals along all seams (one 5-inch space allowed when necessary to permit use of stitching device).

(2) For fiberboard boxes containing not more than 1 inside metal can not exceeding 1 gallon nominal capacity, by application of 2 strips of pressure-sensitive tape not less than $\frac{1}{2}$ inch in width, 1 strip to be placed approximately equal distance over the seam of abutting outer flaps, the other at a right angle to the first and spaced approximately equal distance on the closure face; strips must be of sufficient length to extend not less than 1 inch beyond score lines on side and end panels. Tape shall have a minimum tensile strength of 160 pounds per inch of width; minimum adhesion value of 18 ounces per inch of width; and minimum elongation of 12 percent at break, or having a minimum longitudinal tensile strength of not less than 240 pounds per inch of width; minimum adhesion value

of 18 ounces per inch of width and a minimum elongation of 3 percent at break.

(3) For slotted containers only, reinforced tape complying with the requirements of § 178.207-6(b) is authorized for application over the center seam only. Tape must extend over the ends of box not less than 2½ inches.

(b) Double slide boxes or triple slide boxes, by coating with adhesive the inner slides; for single-flap closures as authorized for boxes with one dimension not over 2 inches, the flaps must be fastened to the body with adhesive.

(c) Fiberboard boxes with covers extending over sides but not to bottom, covers resting on walls of box, or telescope boxes of equal depth section, covers extending to bottom, must be secured by one of the following methods:

(1) By not less than three metal straps, one lengthwise and others at right angles thereto.

(2) When cover extends not less than 3 inches over the walls of the box, by coating with adhesive the entire contact area of the cover.

(d) When metal straps are specified, boxes must be strapped with the required number; size at least ⅝ inch by 0.015 inch.

§ 178.207-18 Marking.

(a) On each container. Symbol in rectangle as follows:

DOT-12D***

(1) Stars to be replaced by authorized gross weight (for example, DOT-12D65, etc.).

(2) Name and address or symbol of person making the mark specified in paragraph (a)(1) of this section and located just above or below that mark. Symbol, if used, must be registered with the Bureau of Explosives.

(3) When metal straps are prescribed, boxes must be marked "----- (number) METAL STRAPS REQUIRED" just above or below the mark specified in this paragraph.

(4) Size of markings: Specification markings prescribed in subparagraph (1) of this paragraph must be at least ½ inch high; other markings must be legible.

§ 178.208 Specification 12E: fiberboard boxes.

§ 178.208-1 Compliance.

(a) Required in all details.

§ 178.208-2 Definitions.

(a) Terms such as "200-pound test" mean minimum strength, Mullen or Cady test.

(b) "Joints" are where edges of parts of box, except recessed flanged heads, are connected together in setting up the box. Generally done by box maker.

(c) "Seams" are where edges of parts of box are visible, except joints, when box is closed.

§ 178.208-3 Corrugated fiberboard.

(a) Both outer facings water resistant; corrugated sheets must be at least 0.009 inch thick and weigh not less than 26 pounds per 1000 square feet; all parts must be securely glued together throughout all contact areas.

§ 178.208-4 Tape.

(a) Coated with glue at least equal to No. 1¾ Peter Cooper standard. Cloth tape of strength, across width, at least 70 units, Elmendorf test. Sisal tape of 2 sheets of No. 1 Kraft paper, total weight 80 pounds per ream (500 sheets, 24 x 36 inches); sheets to be combined with asphalt and reinforced by unspun sisal fibers completely embedded in the asphalt and extending across the tape.

§ 178.208-5 Test.

(a) Acceptable board must have prescribed strength, Mullen or Cady test, after exposure for at least 3 hours to normal atmospheric conditions (50 to 70 percent relative humidity), under test as follows:

(1) Clamp board firmly in machine and turn wheel thereof at constant speed of approximately 2 revolutions per second.

(2) Six punctures required, 3 from each side; all results but one must show prescribed strength.

(3) Board failing may be retested by making 24 punctures, 12 from each side; when all results but 4 show prescribed strength the board is acceptable.

(4) Double-pop tests may be disregarded.

§ 178.208-6 Type authorized.

(a) Corrugated fiberboard with one-piece body with separate flanged heads.

Box is authorized only for 1 or 2 rectangular metal inside containers of not over 5 gallons capacity each.

§ 178.208-7 Forming.

(a) Parts must be cut true to size and so creased and slotted as to fit closely into position without cracking, surface breaks, separation of parts outside of crease, or undue binding.

§ 178.208-8 Joints.

(a) *Body*. Each end of body must have four flanges, creased to bend over outside of body, at least 2½" long beyond crease.

(b) *Butt joint*. One butt joint taped is authorized; 3-inch tape required.

§ 178.208-9 Flanged heads.

(a) Each head must have four flanges, one on each edge, creased to bend over outside body of the box and then under the body flanges, of length at least 5 inches exclusive of creases.

§ 178.208-10 Authorized gross weight (when packed) and parts required.

(a) Board for outside container must be corrugated fiberboard at least 400-pound test; minimum combined weight of component plies, exclusive of adhesives, 180 pounds per 1000 square feet; body must be double-wall board; heads may be double-faced board. Authorized gross weight 110 pounds.

§ 178.208-11 Closing for shipment.

(a) Boxes must be closed by applying heads with head-flanges tucked under body-flanges and then fastening each head in place with a flat steel strap, at least ¾" x 0.015", extending around the 4 sides of the body and securely sealed.

§ 178.208-12 Marking.

(a) Each box must be marked as follows:

(1) DOT-12E110.

(i) This marking shall be enclosed by a rectangle.

(2) Name and address or symbol of person making the mark specified in paragraph (a)(1) of this section and located just above or below that mark. Symbol, if used, must be registered with the Bureau of Explosives.

(3) When metal straps are prescribed, boxes must be marked "---- (number) METAL STRAPS REQUIRED" just above or below the mark specified in paragraph (a)(1) of this section.

(4) Size of markings: Specification markings specified in paragraph (a)(1) of this section must be at least ½ inch high. All markings must be legible.

§ 178.209 Specification 12H; fiberboard boxes.

§ 178.209-1 Compliance.

(a) Required in all details.

§ 178.209-2 Definitions.

(a) Terms such as "200-pound test" mean minimum strength, Mullen or Cady test.

(b) "Joints" are where edges of parts of box are connected together in setting up the box. Generally done by box maker.

(c) "Seams" are where edges of parts of box are visible, except joints, when box is closed.

§ 178.209-3 Classification of board.

(a) Fiberboard is hereby classified by strength of completed board as in first column of the following table; weights specified in the table are the minimum authorized.

Classified strength ¹ of completed board	Facings for corrugated fiberboard	
	Double-faced-minimum combined weight of facings (pounds per 1,000 sq. ft.)	Double-wall-minimum combined weight of facings including center liner (pounds per 1,000 sq. ft.)
275.....	138	110
325.....	138	110
350.....	180	126
375.....	180	180
400.....	180	180
450.....	180	180

¹ Mullen or Cady test (minimum).

§ 178.209-4 Corrugated fiberboard.

(a) Both outer facings water resistant; corrugated sheets must be at least 0.009 inch thick and weigh not less than 26 pounds per 1000 square feet; all parts must be securely glued together throughout all contact areas.

§ 178.209-5 Stitching staples.

Stitching staples must be made in such a configuration that their holding capability as installed will not be less than that of flat steel staples ¾ x 0.019 inch in cross section and not less than 7/16-

inch wide. Materials used must be at least equivalent to copper coated steel in nonsparking quality.

§ 178.209-6 Tape.

(a) Used for manufacturers' joints must be coated with glue at least equal to No. 1³/₄ Peter Cooper standard. Cloth tape of strength, across the woof, at least 70 units, Elmendorf test. Sisal tape of 2 sheets of No. 1 Kraft paper, total weight 80 pounds per ream (500 sheets, 24" x 36"); sheets to be combined with asphalt and reinforced by unspun sisal fibers completely embedded in the asphalt and extending across the tape.

§ 178.209-7 Test.

(a) Acceptable board must have prescribed strength, Mullen or Cady test, after exposure for at least 3 hours to normal atmospheric conditions (50 to 70 percent relative humidity), under test as follows:

(1) Clamp board firmly in machine and turn wheel thereof at constant speed of approximately 2 revolutions per second.

(2) Six punctures required, 3 from each side; all results but one must show prescribed strength.

(3) Board failing may be retested by making 24 punctures, 12 from each side; when all results but 4 show prescribed strength, the board is acceptable.

(4) For corrugated fiberboard, double-pop tests may be disregarded.

§ 178.209-8 Type authorized.

(a) Shall be corrugated fiberboard, telescoping type, 1-piece, 2-piece, or 3-piece construction without recessed heads, as follows:

(1) Box to consist of top and bottom sections divided equally or unequally and inner lining tube. The lining tube must be staple stitched to the lower section of the box to give in effect a 2-piece box. (See § 178.209-11.)

(2) Box to consist of full depth top and bottom sections completely telescoping. No inner lining tube required. Three variations are authorized: one with bottom slotted on ends and cover on sides; second, with both cover and bottom slotted on sides; and third, with sides and ends (both covers and bottom) not slotted, manufacturer's joint a side lap glued or stapled to end, closing flaps to form top and bottom of box with side closing flaps out and overlapping.

NOTE 1: Hand-holes oval in shape, not more than 1 inch in width by 3 inches in length, and horizontal with top score line, are authorized in ends of top section of boxes.

(3) Box to consist of 1-piece, 2-piece, or 3-piece, without recessed heads, fitted with lining tube as prescribed in § 178.209-11, except that lining tube is not required for boxes used for shipment of electric blasting caps packed in accordance with § 173.66(g)(1) of this chapter. When outer flaps butt, inner flaps must also butt, except 1-piece with tube or 2-piece fully telescoping ¹/₂ slotted style may have outer flaps that overlap a minimum of 2 inches to and including full overlap, and inner flaps may be of same length as outer flaps.

(4) Three-piece box without recessed ends. Outer flap may be full lap style with a 3-inch or longer tuck. With the full lap style, the inner end flaps must have a minimum length of 4 inches with or without hand holes.

§ 178.209-9 Forming.

(a) Parts must be cut true to size and so creased and slotted as to fit closely into position without cracking, surface breaks, separation of parts outside of crease, or undue binding.

§ 178.209-10 Joints.

(a) Lapped 1¹/₂" and stitched at 2¹/₂" intervals and within 1" of each end of joint; except for full depth telescope style boxes, body joints must be double-stitched (two parallel rows of stitches).

(b) For glued lap joint, the sides of box forming joint must lap not less than 1¹/₄" and be firmly glued throughout entire area of contact with a glue or adhesive which cannot be dissolved in water after the film application has dried.

(c) For lining tubes only, one butt joint taped (see § 178.209-6) tape not less than 3" wide is authorized.

§ 178.209-11 Authorized gross weight and parts required.

(a) Box shall be corrugated fiberboard at least 275 pound test. Tubes, when required, shall be of solid fiberboard at least 200-pound test, or of corrugated fiberboard of at least 275-pound test, with adjoining edges stitched, taped, or glued.

(b) Authorized gross weight: 65 pounds; boxes may have gross weight of

103 pounds when authorized by § 173.66 (g) (1) of this chapter.

§ 178.209-12 Closing for shipment.

(a) By any method capable of withstanding tests prescribed by § 178.209-16 without failure.

§ 178.209-13 Marking.

(a) On each container. Symbol in rectangle as follows:

DOT-12H**

(1) Stars to be replaced by authorized gross weight (for example DOT-12H65).

(2) Name and address or symbol of person making the mark specified in paragraph (a) (1) of this section and located just above or below that mark. Symbol, if used, must be registered with the Bureau of Explosives.

(3) Size of markings: Specification markings prescribed in subparagraph (1) of this paragraph must be at least $\frac{1}{2}$ inch high; other markings must be legible.

§ 178.209-14 Special tests.

(a) *By whom and when.* By or for each plant making the boxes; at beginning of manufacture and at six-month intervals thereafter; on largest size, by weight. Smaller sizes need not be tested if they have the same or equivalent construction. Report of results, with all pertinent data, to be maintained on file for one year.

§ 178.209-15 Material.

(a) Box material must comply with requirements of §§ 178.209-3, 178.209-4, 178.209-7, 178.209-11, and the following:

(b) Box material must have test strength and moisture content not over 30 percent as follows:

(1) Box material must test at least 200 pounds per square inch immediately after exposure for 3 days to 90 percent relative humidity at not less than 70° nor more than 75° F.

(2) Box material must test at least 100 pounds per square inch immediately after it has been in contact with water

for 3 hours under 3'' head at not less than 70° nor more than 75° F.

NOTE: The test shall be conducted on a sample no greater than 6 inches in diameter when exposed to water. The sample shall be rigidly fastened to a water column device so constructed as to provide at least a 3-inch head of water on the outer surface of the fiberboard sample. The water column device must be suspended in such manner that free circulation of air on the inner surface of fiberboard sample which is not exposed to water is permitted. After contact with water for 3 hours under conditions specified, the water column device shall be emptied, the sample blotted, and immediately subjected to Mullen or Cady test. (A 6-inch diameter pipe having a welded flange to which the sample is secured by a bolted ring flange is acceptable.)

§ 178.209-16 Completed container.

(a) Samples must pass the following immediately after exposure for 2 weeks to 90 percent relative humidity at not less than 70° nor more than 75° F., loaded containers shall contain dummy contents of shape and weight of the expected contents, and shall be closed in the same manner as for shipment:

(1) Three loaded samples to be tested. Each must withstand 200 drops in standard 7-foot revolving test drum with pointed hazard in place, without spilling any contents.

(2) Three loaded samples to be tested. Each must withstand top to bottom pressure of at least 500 pounds without deflection of over $1\frac{1}{2}$ ''.

(3) Three empty samples to be tested. Each must withstand top to bottom pressure of at least 500 pounds without deflection of over $\frac{1}{2}$ inch.

(b) As an alternate to the drum test specified in paragraph (a), 3 loaded samples must pass the drop test specified below:

(1) Box shall be dropped from height of 2 feet.

(2) Identification of face, edge, and corners. Facing one end (with the manufacturer's joint on the observer's right), the top of the box is designated as 1, the right side as 2, the bottom as 3, and the left side as 4. The near end is designated as 5 and the far end as 6. The edges are identified by the number of the two faces which make that edge, as for example, 1-2 identifies the edge where the top and right side meet and

2-5 the edge having the manufacturer's joint. The corners are identified by the number of the three faces which meet to form that corner, as for example, 1-2-5 identifies the corner where the top, the right side, and the near end meet.

(c) Drop sequence as follows:

(1) A corner drop on 1-2-5.

(2) An edge drop on the shortest edge radiating from that corner (usually 2-5).

(3) An edge drop on the next shortest edge radiating from that corner (usually 1-5).

(4) An edge drop on the longest edge radiating from that corner (usually 1-2).

(5) A flatwise drop on one of the smallest faces (usually end 5 or 6).

(6) A flatwise drop on the opposite smallest face.

(7) A flatwise drop on one of the medium faces (usually side 2 or 4).

(8) A flatwise drop on the opposite medium face.

(9) A flatwise drop on one of the largest faces (usually top 1 or bottom 3).

(10) A flatwise drop on the opposite large face.

This completes one cycle of ten drops. Commence the next cycle, with a drop on the corner diagonally opposite through the box to the corner on which the first drop was made, on corner 3-4-6. Commence the third cycle of ten drops with corner 1-4-5. Each loaded container must withstand 3 cycles without spilling or sifting of contents.

§ 178.210 Specification 12A; fiberboard boxes.

Nonreuseable containers.

§ 178.210-1 Compliance.

(a) Required in all details.

§ 178.210-2 Definitions.

(a) Terms such as "200-pound test" mean minimum strength, Mullen or Cady test.

(b) "Joints" are where edges of parts of box, except recessed flanged heads, are connected together in setting up the box. Generally done by box maker.

§ 178.210-3 Classification of board.

(a) Fiberboard is hereby classified by strength¹ of completed board as in first column of the following table; weights specified in the table are the minimums authorized.

¹ Mullen or Cady test (minimum).

Classified strength ¹ of completed board	Facings for corrugated fiberboard	
	Double-faced-minimum combined weight of facings (pounds per 1,000 sq. ft.)	Double-wall-minimum combined weight of facings including center liner (pounds per 1,000 sq. ft.)
200.....	84	92
275.....	138	110

¹ Mullen or Cady test (minimum).

§ 178.210-4 Corrugated fiberboard.

(a) Both outer facings water resistant; corrugated sheets must be at least 0.009 inch thick and weigh not less than 26 pounds per 1000 square feet; all parts must be securely glued together throughout all contact areas.

§ 178.210-5 Tests.

(a) Acceptable board must have prescribed strength, Mullen or Cady test, after exposure for at least 3 hours to normal atmospheric conditions (50 to 70 percent relative humidity), under test as follows:

(1) Clamp board firmly in machine and turn wheel thereof at constant speed of approximately 2 revolutions per second.

(2) Six punctures required, 3 from each side; all results but one must show prescribed strength.

(3) Board failing may be retested by making 24 punctures, 12 from each side, when all results but 4 show prescribed strength the board is acceptable.

(4) Double-pop tests may be disregarded.

§ 178.210-6 Boxes authorized.

(a) Corrugated fiberboard boxes having gross weight not over 80 pounds of the following strengths are authorized:

Gross weight not over (pounds)	Corrugated fiberboard strength (Mullen or Cady test) minimum	
	Double-faced	Double-wall
20.....	200	200
50.....	275	200
80.....		275

§ 178.210-7 Forming.

(a) Parts must be cut true to size and so created and slotted as to fit closely into position without cracking, surface breaks, separation of parts outside of crease, or undue binding.

§ 178.210-8 Joints.

(a) For slotted containers: Lapped $1\frac{1}{2}$ inches from center of scoreline except as in § 178.210-8(b) (2); stitched at $2\frac{1}{2}$ -inch intervals and within 1 inch of each end of joint; body joint must be double-stitched (2 parallel stitches) at each end of joint over 18 inches long.

(b) Joints as provided for by the following are authorized provided resulting joint is capable of withstanding the tests prescribed by § 178.210-10:

(1) For slotted containers only; one butt joint, taped, is authorized.

(2) For glued lap joint, the sides of box forming joint must lap not less than $1\frac{1}{4}$ inches and be firmly glued throughout entire area of contact with a glue of adhesive which cannot be dissolved in water after the film application has dried.

(3) For triple and double slide boxes, joints of all slides must be taped or stitched.

§ 178.210-9 Inside cushioning.

(a) Sufficient inside cushioning shall be required for protection of inside containers so that completed packages as offered for shipment shall be capable of withstanding test prescribed by § 178.210-10.

§ 178.210-10 Test for completed package.

(a) A minimum of 4 boxes with inside containers filled with water, and box closed as for shipment, shall be capable of withstanding the following drop tests from the prescribed heights onto solid concrete without leakage from or breakage of any inside container or rupture of the outside fiberboard box; each box shall be subjected to not more than one of the series of tests:

(1) Box No. 1. Flat drop on bottom from height of 4 feet.

(2) Box No. 2. Flat drop on side from height of 4 feet.

(3) Box No. 3. Flat drop on end from height of 4 feet.

(4) Box No. 4. Flat drop on top from height of 2 feet.

(b) Tests prescribed by paragraph (a) of this section must be conducted prior

to initial use of the package and shall be repeated on the change of any components of the package.

§ 178.210-11 Closing for shipment.

(a) By any method capable of withstanding tests prescribed by § 178.210-10.

§ 178.210-12 Marking.

(a) On each container. Symbol in rectangle as follows:

DOT-12**

(1) Stars to be replaced by authorized gross weight (for example, DOT-12A75). The letters NRC, located just above or below the DOT mark, to indicate a non-reuseable container.

(2) Name and address or symbol of person making the marks specified in paragraph (a)(1) of this section and located just above or below those marks. Symbol, if used, must be registered with the Bureau of Explosives.

(3) Size of markings: Specification markings prescribed in subparagraph (1) of this paragraph must be at least $\frac{1}{2}$ inch high; other markings must be legible.

§ 178.211 Specification 12P; fiberboard boxes. Nonreusable containers for one inside plastic container greater than 1-gallon capacity, as prescribed in Part 173 of this chapter.

§ 178.211-1 Material requirements.

(a) Boxes shall be of corrugated fiberboard, except as otherwise authorized in this specification, having both outer facings water resistant; corrugating medium shall be at least 0.009 inch thick and weigh not less than 26 pounds per 1,000 square feet; all parts shall be securely glued together throughout all contact areas.

(b) Solid fiberboard is authorized when of strength equal to corrugated fiberboard and in conformance with paragraph (c) of this section.

(c) Fiberboard required and tests as follows:

(1) Fiberboard is hereby classified by strength¹ of completed board as in first column of the following table; weights

¹ Mullen or Cady Test (minimum)

specified in the table are the minimums authorized.

(2) Tests of acceptable completed board must have prescribed strength,

Mullen or Cady test, after exposure for at least 3 hours to normal atmospheric conditions (50 to 70 percent relative humidity) under test, as follows:

Classified strength of completed board ¹	Solid fiberboard—minimum combined weight of component plies exclusive of adhesives (pounds per 1,000 sq. ft.)	Single-wall—minimum combined weight of facings (pounds per 1,000 sq. ft.)	Double-wall—minimum combined weight of facings including center facings (pounds per 1,000 sq. ft.)
175	149	77	72
200	190	84	72
275	237	138	110
325	237	138	110
370	283	180	126
375	283	180	180
400	283	180	180
450	283	180	180
500	330		222

¹ Mullen or Cady Test (minimum).

(i) Clamp board firmly in machine and turn wheel at constant speed of approximately 2 revolutions per second.

(ii) Six bursts required, 3 from each side; all results but one must show prescribed strength.

(iii) Board failing may be retested by making 24 bursts, 12 from each side; when all results but 4 show prescribed strength the board is acceptable.

(iv) For corrugated fiberboard, double-pop tests may be disregarded.

§ 178.211-2 Construction requirements.

(a) Corrugated or solid fiberboard boxes of any type capable of withstanding tests prescribed by § 178.211-5 authorized when constructed in accordance with requirements of this section.

(b) Corrugated or solid fiberboard boxes in accordance with the following table are authorized.

Gross weight not over (pounds)	Strength of fiberboard (minimum) Mullen or Cady test		
	Solid board	Single-wall corrugated	Double-wall corrugated
20	200	200	200
60	350	350	275
80	500	450	350

(c) All parts must be cut true to size and so creased and slotted as to fit closely into position without cracking, surface breaks, separation of parts outside of crease, or undue binding. Box must provide snug fit for inside plastic container.

(d) Joints (manufacturer's). The joint is defined as that part of the box

where the ends of the sheet are joined together by taping, stitching or gluing.

(1) For glued or stitched lap joint, the sides of box forming joint must lap not less than 1¼ inches. Glued joints must be firmly glued throughout entire area of contact with a glue or adhesive which cannot be dissolved in water after film application has dried.

(2) Butt-joints, taped, are authorized providing resulting joints are capable of withstanding tests prescribed by § 178.211-5.

§ 178.211-3 Design limitations.

(a) Design limitations are as follows:

(1) Permitted when perforated or die-cut areas remain intact following tests prescribed for box by § 178.211-5.

(i) Outer closing flaps may have perforated areas of no greater size than is necessary to provide access to closure of plastic container; inner flaps may have die-cut areas of similar type.

(ii) Die-cut holes in outer and inner closing flaps when closure for plastic container is attached to a metal plate inserted between the inner and outer flaps or when closure area is protected by means of a plug-in or screw cap or similar device. The diameter of these holes shall be less than the diameter of the metal plate.

(iii) Inside facing of fiberboard closure flaps may be cut or perforated for opening. A tear strip may be incorporated in the body wall of fiberboard boxes provided it is above the shoulder area of the plastic container and this may be accompanied by a nominal thumb-notch

in the manufacturer's joint or in a side panel of the box.

(iv) Handholes, by perforation or other means, in any part of the box providing the face having the handhole is backed up by a fiberboard sheet of equal strength of box in full height and width of that face or that handholes are above the neck area of the plastic container. No more than one handhole in any face nor more than two per box.

(v) Other perforated or die cut areas of a size and location as authorized in writing by the Bureau of Explosives or Board of Transport Commissioners for Canada.

(2) Not permitted:

(i) Stitched manufacturer's joint or stitched closures when any such stitch (staple) is in direct contact with the inside plastic container.

§ 178.211-4 Closure.

(a) Closure of any type is authorized provided representative boxes are capable of withstanding tests prescribed by § 178.211-5.

§ 178.211-5 Tests.

(a) Representative samples of the completed composite container assembled, filled and closed as for use must be capable of withstanding tests prescribed in the specification for the inside plastic container without rupture of the fiberboard boxes that produces a condition of the box that could result in potential damage to the inside container.

§ 178.211-6 Marking.

(a) On each container. Symbol in rectangles as follows:

DOT-12P**

(1) Stars to be replaced by authorized gross weight for which box was constructed (for example, DOT-12P80). The letters NRC, located just above or below the DOT mark, to indicate a non-reusable container.

(2) Name and address or symbol of person making the marks specified in paragraph (a)(1) of this section and located just above or below those marks. Symbol, if used, must be registered with the Bureau of Explosives.

(3) Size of markings: Specification as prescribed in paragraph (a)(1) of this

section must be at least $\frac{1}{2}$ inch high; other marks must be legible.

§ 178.212 Specification 12R; paper-faced expanded polystyrene board boxes. Nonreusable containers.

§ 178.212-1 Material requirements.

(a) The board shall consist of completely fused closed cell expanded polystyrene with tightly adhered natural kraft paper facings for which detailed requirements are as follows:

(1) Basis weight of each facing, minimum, 42 pounds per 1,000 square feet (Basis weight of combined facings, minimum, 84 pounds per 1,000 square feet.)

(2) Basis weight of board, minimum, 123 pounds per 1,000 square feet.

(3) Thickness of board, minimum, 0.21 inch.

(4) Moisture absorption, maximum, 25 grams weight gain per square foot with sample completely immersed in water. For 1 hour sample to be pre-conditioned to a constant weight at least 73° F. and 50 percent relative humidity prior to immersion.

(5) Adhesion of facings; no delamination after 24 hours with sample completely immersed in water. Sample shall be not less than 1 square foot.

§ 178.212-2 Forming.

(a) Parts must be cut true to size and so creased and slotted as to fit closely in position without cracking, surface breaks, separation of parts outside of crease, or undue binding.

§ 178.212-3 Joints.

(a) *Definition.* The seam where the two edges of the box blank are joined by the box manufacturer.

(b) The joints shall be made by pre-crushing the lap area of the board to a minimum combined thickness of 0.28 inch, and then securing by either stitching or gluing as follows:

(1) By lapping $1\frac{1}{2}$ inches from center of score line and stitching at $2\frac{1}{2}$ inch intervals and within 1 inch of each end joint; body joint over 18 inches long must be double stitched (two parallel stitches) at each end of joint.

(2) By lapping $1\frac{1}{2}$ inches from center of score line and firm gluing throughout entire area of contact with an adhesive which cannot be dissolved in water after the adhesive applied has dried.

§ 178.212-4 Inside cushioning.

(a) Sufficient inside cushioning shall be required for protection of inside containers so that completed package as offered for shipment shall be capable of withstanding test prescribed by § 178.212-6.

(b) The cushioning shall be either paper-faced expanded polystyrene board meeting the requirements of § 178.212-1 or equally efficient preformed completely fused closed cell expanded polystyrene.

§ 178.212-5 Gross weight authorized.

(a) Seventy-five pounds maximum.

§ 178.212-6 Tests for completed package.

(a) A minimum of four boxes with inside containers filled with water, and box closed as for shipment shall be capable of withstanding either of the following tests without leakage from or breakage of any inside container or rupture of the outside containers:

(1) Drop test onto solid concrete: each box should be subjected to not more than one of the series of tests:

Box No. 1—Flat drop on bottom from height of 4 feet.

Box No. 2—Flat drop on side from height of 4 feet.

Box No. 3—Flat drop on end from height of 4 feet.

Box No. 4—Flat drop on top from height of 2 feet.

(2) Swing test on boxed glass swing test apparatus as prescribed by spec. 1A (§ 178.1); each box shall be swung from 75 inches distance once on each of the six faces.

(b) Tests prescribed by paragraph (a) of this subsection must be conducted prior to initial use of the package and shall be repeated on the change of any components of the package.

§ 178.212-7 Closing for shipment.

(a) By any method capable of withstanding tests prescribed by § 178.212-6.

§ 178.212-8 Markings.

(a) On each container. Symbol in rectangle as follows:

DOT-12R**

(1) Stars to be replaced by authorized gross weight (for example, DOT-12R75). The letters NRC, located just above or below the DOT mark, to indicate a non-reusable container.

(2) Name or symbol of person making the other marks specified in this section and located on the same face as those other marks. Symbol, if used, must be registered with the Bureau of Explosives.

(3) Size of markings. Specification markings prescribed in paragraph (a) (1) of this subsection must be at least one-half inch high; other markings must be legible.

§ 178.214 Specification 23F; fiberboard boxes.

§ 178.214-1 Compliance.

(a) Required in all details.

§ 178.214-2 Definitions.

(a) Terms such as "200-pound test" mean minimum strength, Mullen or Cady test.

(b) "Joints" are where edges of parts of box are connected together in setting up the box. Generally done by box maker.

(c) "Seams" are where edges of parts of box are visible, except joints, when box is closed.

§ 178.214-3 Solid fiberboard.

(a) To be 3-ply or more; both outer plies waterproofed.

§ 178.214-4 Corrugated fiberboard.

(a) Both outer facings water resistant; corrugated sheets at least 0.009" thick; all parts securely glued together throughout all contact areas; minimum combined weight of facings not less than 84 pounds per 1,000 square feet, except when only one lining tube is used as provided by § 178.214-15 (b), minimum combined weight of facings must be not less than 138 pounds per 1,000 square feet.

§ 178.214-5 Stitching staples.

Stitching staples must be made in such a configuration that their holding capability as installed will not be less than that of flat steel staples $3\frac{3}{32}$ x 0.019 inch in cross section and not less than $7\frac{1}{16}$ -inch wide. Material used must be at least equivalent to copper coated steel in non-sparking quality.

§ 178.214-6 Tape.

(a) Coated with glue at least equal to No. 1 $\frac{3}{4}$ Peter Cooper standard. Cloth tape of strength, across the woof, at least 70 units, Elmendorf test. Sisal tape of 2 sheets of No. 1 Kraft paper, total weight 80 pounds per ream (500 sheets, 24" x 36"); sheets to be combined with asphalt and reinforced by unspun sisal fibers completely embedded in the asphalt and extending across the tape.

§ 178.214-7 Test.

(a) Acceptable board must have prescribed strength. Mullen or Cady test, under test as follows:

(1) Clamp board firmly in machine and turn wheel thereof at constant speed of approximately 2 revolutions per second.

(2) Six punctures required, 3 from each side; all results but one must show prescribed strength.

(3) Board failing may be retested by making 24 punctures, 12 from each side; when all results but 4 show prescribed strength the board is acceptable.

(4) For corrugated fiberboard, double-pop tests may be disregarded.

§ 178.214-8 Type authorized.

(a) Of solid fiberboard; 1-piece, or 3-piece without recessed heads, fitted with lining tube or lining tubes as prescribed in § 178.214-15, except that lining tubes are not required for boxes used for shipments of high explosives packed in accordance with § 173.63(a)(3) of this chapter or electric blasting caps packed in accordance with § 173.66(g)(1) of this chapter, or when box is constructed of 1-piece of not less than 600-pound test board weighing not less than 300 pounds per 1,000 square feet. Boxes having handholes are authorized when approved by the Bureau of Explosives.

§ 178.214-9 Inside packing and size limits.

(a) As prescribed in § 178.214-15.

§ 178.214-10 Forming.

(a) Parts must be cut true to size and so creased and slotted as to fit closely into position without cracking, surface breaks, separation of parts outside of crease, or undue binding.

§ 178.214-11 Joints.

(a) Lapped $1\frac{1}{2}$ inches from center of scoreline except as in § 178.214-12; stitched at $2\frac{1}{2}$ -inch intervals and within 1 inch of each end of joint; double-stitched (2 parallel stitches) at each end of joint over 18 inches long; or lapped not less than $1\frac{1}{4}$ inches and firmly glued throughout entire area of contact with a glue or adhesive which cannot be dissolved in water after the film application has dried.

§ 178.214-12 Flanged heads.

(a) Must have 4 flanges at least 1" long above fillet, on each head. Recessed flanged heads not authorized.

§ 178.214-13 Seams which are to be stitched.

(a) Overlap, if any, required to be at least $1\frac{1}{2}$ inches from center of scoreline except as in § 178.214-12.

§ 178.214-14 Flap closures.

(a) Flaps must butt or have full overlap excepting that inner flaps may overlap $\frac{1}{2}$ inch.

§ 178.214-15 Authorized gross weight (when packed) and parts required.

(a) Box to be of solid fiberboard, special waterproofed, at least 300-pound test, and weighing at least 250 pounds per thousand square feet. Tubes to be of solid or corrugated fiberboard at least 200-pound test and of 1-piece, or as provided in subparagraph (1) of this paragraph, with adjoining edges stitched, taped, or glued. Glued or stitched lap not less than $1\frac{1}{4}$ ". Lap must be firmly glued throughout entire area of contact with glue or adhesive which cannot be dissolved in water after the film application has dried.

(1) Or, box shall have one tube liner of solid fiberboard weighing at least 283 pounds per 1,000 square feet with joint or joints either stitched or glued as prescribed in paragraph (a) of this section. One end of the tube may have a handhole approximately $\frac{3}{4}$ " deep located at the center of the top and a perforation with a minimum of $\frac{1}{8}$ " cuts and $\frac{1}{8}$ "

webs extending from the handhole to the bottom.

(b) Authorized gross weight; 65 pounds when 2 or more lining tubes are used to divide the box into 2 or more compartments; 65 pounds when 1 or more lining tubes are used and contents will consist of 1 cartridge only or of black powder in bags; 65 pounds when boxes without lining tubes are used for shipments of high explosives packed in accordance with § 173.63(a)(3) of this chapter or electric blasting caps packed in accordance with § 173.66(g)(1) of this chapter; 35 pounds in all other cases except that boxes having a single solid fiberboard lining tube, the fiberboard weighing at least 283 pounds per 1,000 square feet, or corrugated fiberboard lining tube as prescribed in § 178.214-4 (a), are authorized for 65 pounds gross weight.

§ 178.214-16 Closing for shipment.

(a) By any method capable of withstanding tests prescribed by § 178.214-20 without failure.

§ 178.214-17 Marking.

(a) On each container. Symbol in rectangle as follows:

DOT-23F***

(1) Stars to be replaced by authorized gross weight (for example, DOT-23F35 or DOT-23F65).

(2) Name and address or symbol of person making the mark specified in paragraph (a)(1) of this section and located just above or below that mark. Symbol, if used, must be registered with the Bureau of Explosives.

(3) Size of markings: Specification markings prescribed in subparagraph (1) of this paragraph must be at least $\frac{1}{2}$ inch high; other markings must be legible.

§ 178.214-18 Special tests.

(a) *By whom and when.* By or for each plant making the boxes; at beginning of manufacture and at six-month intervals thereafter; on largest size, by weight. Smaller sizes need not be tested if they have the same or equivalent construction. Report of results, with all pertinent data, to be maintained on file

for one year.

§ 178.214-19 Material.

(a) Box material (special water-proofed board) must be 300-pound test board and weigh at least 250 pounds per thousand square feet when commercially dry.

(b) Box material must also have 200-pound test strength and moisture content not over 30 percent as follows:

(1) Immediately after exposure for 3 days to 90 percent humidity at 75° F.

(2) Immediately after it has been in contact with water for 3 hours under 3'' head at 75° F.

NOTE: The test shall be conducted on a sample no greater than 6 inches in diameter when exposed to water. The sample shall be rigidly fastened to a water column device so constructed as to provide at least a 3-inch head of water on the outer surface of the fiberboard sample. The water column device must be suspended in such manner that free circulation of air on the inner surface of fiberboard sample which is not exposed to water is permitted. After contact with water for 3 hours under conditions specified, the water column device shall be emptied, the sample blotted, and immediately subjected to Mullen or Cady test. (A 6-inch diameter pipe having a welded flange to which the sample is secured by a bolted ring flange is acceptable.)

§ 178.214-20 Completed containers.

(a) Samples must pass the following immediately after exposure for 2 weeks to 90 percent humidity at 75° F.; loaded containers shall contain dummy contents of shape and weight of the expected contents, and shall be closed in same manner as for shipment:

(1) Three loaded samples to be tested. Each must withstand 200 drops in standard 7-foot revolving test drum with pointed hazard in place without spilling any contents.

(2) Three loaded samples to be tested. Each must withstand end to end pressure of at least 500 pounds without deflection of over $1\frac{1}{2}$ ''.

(3) Three empty samples to be tested. Each must withstand top to bottom pressure of at least 500 pounds without deflection of over $\frac{1}{2}$ inch.

(b) As an alternate to the drum test specified in paragraph (a), 3 loaded samples must pass the drop test specified below:

(1) Box shall be dropped from height of 2 feet.

(2) Identification of face, edge, and corners. Facing one end (with the manufacturer's joint on the observer's right), the top of the box is designated as 1, the right side as 2, the bottom as 3, and the left side as 4. The near end is designated as 5 and the far end as 6. The edges are identified by the number of the two faces which make that edge, as for example, 1-2 identifies the edge where the top and right side meet and 2-5 the edge having the manufacturer's joint. The corners are identified by the number of the three faces which meet to form that corner, as for example, 1-2-5 identifies the corner where the top, the right side, and the near end meet.

(c) Drop sequence as follows:

(1) A corner drop on 1-2-5.
(2) An edge drop on the shortest edge radiating from that corner (usually 2-5).

(3) An edge drop on the next shortest edge radiating from that corner (usually 1-5).

(4) An edge drop on the longest edge radiating from that corner (usually 1-2).

(5) A flatwise drop on one of the smallest faces (usually end 5 or 6).

(6) A flatwise drop on the opposite smallest face.

(7) A flatwise drop on one of the medium faces (usually side 2 or 4).

(8) A flatwise drop on the opposite medium face.

(9) A flatwise drop on one of the largest faces (usually top 1 or bottom 3).

(10) A flatwise drop on the opposite large face.

(d) This completes one cycle of ten drops. Commence the next cycle with a drop on the corner diagonally opposite through the box to the corner on which the first drop was made, on corner 3-4-6. Commence the third cycle of ten drops with corner 1-4-5. Each loaded container must withstand 3 cycles without spilling or sifting of contents.

§ 178.218 Specification 23G; special cylindrical fiberboard box for high explosives.

§ 178.218-1 Compliance.

(a) Required in all details.

§ 178.218-2 Definition.

(a) Terms such as "200-pound test" mean minimum strength, Mullen or Cady test.

§ 178.218-3 Side walls, ends, and interior.

(a) Side walls. To be not less than four-ply of continuous fiber sheets convolutely or spirally wound; combined strength to be not less than 300 pounds, dry; combined thickness to be not less than 0.050" for containers not exceeding 10 pounds gross weight and not less than 0.060" for containers over 10 pounds gross weight.

(b) Ends. To be of one or more plies of fiberboard sufficiently strong to withstand prescribed tests. Wax or plastic material with fiberboard inserts authorized provided the completed container will withstand the prescribed tests at temperatures from zero to one hundred thirty degrees F.

(c) Interior. Interior of the container must be lined or so treated as to prevent penetration by the commodity with which the container is filled for shipping.

§ 178.218-4 Stitching staples.

Stitching staples must be made in such a configuration that their holding capability as installed will not be less than that of flat steel staples $\frac{3}{32}$ x 0.019 inch in cross section and not less than $\frac{7}{16}$ -inch wide. Material used must be at least equivalent to copper coated steel in non-sparking quality.

§ 178.218-5 Tape.

(a) Coated with animal glue at least equal to No. 1 $\frac{3}{4}$ Peter Cooper standard or other adhesive equivalent in tensile properties and resistance to deterioration. Cloth tape of strength, across the woof, at least 70 units, Elmendorf test. Sisal tape of 2 sheets of No. 1 Kraft paper, total weight 80 pounds per ream (480 sheets, 24" x 36"); sheets to be combined with asphalt and reinforced by unspun sisal fibers completely embedded in the asphalt and extending across the tape.

§ 178.218-6 Test of board.

(a) Acceptable board must have prescribed strength, Mullen or Cady test, under test as follows:

(1) Clamp board firmly in machine and turn wheel thereof at constant speed of approximately 2 revolutions per second.

(2) Six punctures required, 3 from each side; all results but one must show prescribed strength.

(3) Board failing may be retested by making 24 punctures, 12 from each side; when all results but 4 show prescribed strength the board is acceptable.

§ 178.218-7 Type of container authorized.

- (a) One cylindrical tube or;
- (b) Two cylindrical tubes butted together and taped or glued completely around circumference at joints to make positive closure.
- (c) Open ends to be closed in such a manner as to give complete closure which will withstand prescribed tests.

§ 178.218-8 Approval of specification required.

(a) Specification for each type of container manufactured (under the specification) must be filed with and approved by the Bureau of Explosives. Changes in construction (container and closure) differing from specification thus filed must be approved before authorized for use.

§ 178.218-9 Authorized size and weight limit.

- (a) Maximum authorized outside diameter of container is 12".
- (b) Maximum authorized gross weight of container is 65 pounds.

§ 178.218-10 Marking.

(a) On each container by symbol as follows:

DOT-23G***

(1) Stars to be replaced by *authorized gross weight* (for example, DOT-23G40, DOT-23G65, etc.).

(2) Name or symbol of person making the mark specified in paragraph (a) (1) of this section and located just above or below that mark. Symbol, if used, must be registered with the Bureau of Explosives.

(3) Size of markings: Specification markings prescribed in subparagraph (1) of this paragraph must be at least ½ inch high; other markings must be legible.

§ 178.218-11 Special tests.

(a) *By whom and when.* By or for each plant making the boxes; at begin-

ning of manufacture and at 6-month intervals thereafter; on largest size, by weight. Smaller sizes need not be tested if they have the same or equivalent construction. Report of results, with all pertinent data, to be maintained on file for one year.

§ 178.218-12 Material.

(a) Box material must be not less than 300 pound test board when commercially dry.

(b) Box material must also have 200-pound test strength, moisture content not over 30 percent and puncture strength not less than 200 units, as determined by General Electric Puncture Tester using an average obtained from a series of five tests, as follows:

(c) Immediately after exposure for 3 days under either of the following conditions.

- (1) 70 percent humidity at 100° F.
- (2) 90 percent humidity at 75° F.

§ 178.218-13 Completed containers.

(a) Samples must pass the following tests immediately after exposure for 2 weeks to 90 percent humidity at 75° F. or 70 percent humidity at 100° F.; loaded containers shall contain dummy contents of shape and weight same as expected contents.

(1) Three loaded samples to be tested. Each must withstand end to end pressure of at least 500 pounds with deflection of over 1½"; speed of compression tested to be ½" per minute plus ¼" minus ¼" per minute.

(2) Three loaded samples to be tested. Each must withstand side to side pressure of at least 500 pounds without deflection of over ½"; except that for boxes with fluted crimped ends the deflection shall not exceed ¾"; speed of compression tested to be ½" per minute plus ¼" minus ¼" per minute.

(3) Three loaded samples to be tested. Each must withstand, without rupture, four 4-foot drops diagonally on the end more likely to cause rupture on impact.

(4) Three loaded samples to be tested. Each must be dropped once, flat on its side, across another similar package lying flat upon the ground with its longitudinal axis at right angles to container dropped. Drops must be made from a height four feet above the topmost point of the container on the ground.

(b) As an alternate to compression test requirements of paragraph (a) (1) and (2) of this section, samples must pass the following tests immediately after exposure for 2 weeks to 90 percent humidity at 75° F. or 70 percent humidity at 100° F.; loaded containers shall contain dummy contents of shape and weight same as expected contents. Static loading tests as specified herein must be conducted with the prescribed weight in place for at least 60 minutes, with deflection of container not in excess of the following:

(1) Three loaded samples to be tested. Each container must be capable of withstanding end-to-end pressure of at least 375 pounds without deflection over 1½ inches.

(2) Three loaded samples to be tested. Each container must be capable of withstanding side-to-side pressure of at least 350 pounds without deflection over ½ inch.

§ 178.219 Specification 23H; fiberboard boxes.

§ 178.219-1 Compliance.

(a) Required in all details.

§ 178.219-2 Definitions.

(a) Terms such as "200-pound test" mean minimum strength, Mullen or Cady test.

(b) "Joints" are where edges of parts of box are connected together in setting up box.

(c) "Seams" are where edges of parts of box are visible, except joints, when box is closed.

§ 178.219-3 Solid fiberboard.

(a) To be 3-ply or more; both outer plies waterproofed.

§ 178.219-4 Stitching staples.

Stitching staples must be made in such a configuration that their holding capability as installed will not be less than that of flat steel staples 3/32 x 0.019 inch in cross section and not less than 7/16-inch wide. Material used must be at least equivalent to copper coated steel in nonsparking quality.

§ 178.219-5 Tape.

(a) Coated with glue at least equal to No. 1¾ Peter Cooper standard. Cloth

tape of strength, across the woof, at least 70 units. Elmendorf test. Sisal tape of 2 sheets of No. 1 kraft paper, total weight 80 pounds per ream (500 sheets, 24" x 36"); sheets to be combined with asphalt and reinforced by unspun sisal fibers completely embedded in the asphalt and extending across the tape.

§ 178.219-6 Test.

(a) Acceptable board must have prescribed strength, Mullen or Cady test, under test as follows:

(1) Clamp board firmly in machine and turn wheel thereof at constant speed of approximately 2 revolutions per second.

(2) Six punctures required, 3 from each side; all results but one must show prescribed strength.

(3) Board failing may be retested by making 24 punctures, 12 from each side; when all results but 4 show prescribed strength the board is acceptable.

§ 178.219-7 Type authorized.

(a) Of solid fiberboard, telescoping type construction without recessed heads. Box to consist of top and bottom sections, divided equally or unequally, and inner lining tube or full depth cover 2-piece telescope type in which case the lining tube may be omitted. The lining tube, when required, must be staple stitched to the lower section of the box to give in effect a 2-piece box.

(b) Hand-holes oval in shape, not more than 1 inch in width by 3 inches in length and horizontal with top score line, are authorized in ends of top section of full depth cover telescope type boxes.

§ 178.219-8 Inside packing and size limits.

(a) As prescribed in § 178.219-11.

§ 178.219-9 Forming.

(a) Parts must be cut true to size and so creased and slotted as to fit closely into position without cracking, surface breaks, separation of parts outside of crease, or undue binding.

§ 178.219-10 Joints.

(a) Lapped at least 1½ inches from center of scoreline; staple stitched at 2½-inch intervals and within 1 inch of each end of joint; 2 banks of staple stitches in each joint.

§ 178.219-11 Authorized gross weight (when packed) and parts required.

(a) Box to be of solid fiberboard special waterproofed at least 300-pound test, and weighing at least 250 pounds per thousand square feet. Tubes to be of solid fiberboard at least 200-pound test and of 1 piece with adjoining edges staple stitched or taped.

(b) Authorized gross weight: 65 pounds when 2 or more lining tubes are used to divide the box into 2 or more compartments; 65 pounds when 1 or more lining tubes are used and contents will consist of 1 cartridge only or of black powder in bags; 35 pounds in all other cases except that boxes having a single solid fiberboard lining tube, the fiberboard weighing at least 283 pounds per 1,000 square feet, are authorized for 65 pounds gross weight. Boxes of 2-piece telescope type having full depth cover are authorized for 65 pounds gross weight.

§ 178.219-12 Closing for shipment.

(a) By any method capable of withstanding tests prescribed by § 178.219-16 without failure.

§ 178.219-13 Marking.

(a) On each container. Symbol in rectangle as follows:

•
DOT-23H***

(1) Stars to be replaced by authorized gross weight (for example DOT-23H35 or DOT-23H65).

(2) Name and address or symbol of person making the mark specified in paragraph (a)(1) of this section and located just above or below that mark. Symbol, if used, must be registered with the Bureau of Explosives.

(3) Size of markings: Specification markings prescribed in subparagraph (1) of this paragraph must be at least $\frac{1}{2}$ inch high; other markings must be legible.

§ 178.219-14 Special tests.

(a) *By whom and when.* By or for each plant making the boxes; at beginning of manufacture and at six-month intervals thereafter; on largest size, by weight. Smaller sizes need not be tested

if they have the same or equivalent construction. Report of results, with all pertinent data, to be maintained on file for one year.

§ 178.219-15 Material.

(a) Box material (special waterproofed board) must be 300-pound test board and weigh at least 250 pounds per thousand square feet when commercially dry.

(b) Box material must also have 200-pound test strength and moisture content not over 30 percent as follows:

(1) Immediately after exposure for 3 days to 90 percent humidity at 75° F.

(2) Immediately after it has been in contact with water for 3 hours under 3" head at 75° F.

NOTE: The test shall be conducted on a sample no greater than 6 inches in diameter when exposed to water. The sample shall be rigidly fastened to a water column device so constructed as to provide at least a 3-inch head of water on the outer surface of the fiberboard sample. The water column device must be suspended in such manner that free circulation of air on the inner surface of fiberboard sample which is not exposed to water is permitted. After contact with water for 3 hours under conditions specified, the water column device shall be emptied, the sample blotted, and immediately subjected to Mullen or Cady test. (A 6-inch diameter pipe having a welded flange to which the sample is secured by a bolted ring flange is acceptable.)

§ 178.219-16 Controlled containers.

(a) Samples must pass the following immediately after exposure for 2 weeks to 90 percent humidity at 75° F.; loaded containers shall contain dummy contents of shape and weight of the expected contents, and shall be closed in same manner as for shipment:

(1) *Three loaded samples to be tested.* Each must withstand 200 drops in standard 7-foot revolving test drum with pointed hazard in place, without spilling any contents.

(2) *Three loaded samples to be tested.* Each must withstand end to end pressure of at least 500 pounds without deflection of over $1\frac{1}{2}$ ".

(3) *Three empty samples to be tested.* Each must withstand top to bottom pressure of at least 500 pounds without deflection of over $\frac{1}{2}$ inch.

(b) As an alternate to the drum test specified in paragraph (a), 3 loaded samples must pass the drop test specified below:

(1) Box shall be dropped from height of 2 feet.

(2) Identification of face, edge, and corners. Facing one end (with the manufacturer's joint on the observer's right), the top of the box is designated as 1, the right side as 2, the bottom as 3, and the left side as 4. The near end is designated as 5 and the far end as 6. The edges are identified by the number of the two faces which make that edge, as for example, 1-2 identifies the edge where the top and right side meet and 2-5 the edge having the manufacturer's joint. The corners are identified by the number of the three faces which meet to form that corner, as for example, 1-2-5 identifies the corner where the top, the right side, and the near end meet.

(c) Drop sequence as follows:

(1) A corner drop on 1-2-5.

(2) An edge drop on the shortest edge radiating from that corner (usually 2-5).

(3) An edge drop on the next shortest edge radiating from that corner (usually 1-5).

(4) An edge drop on the longest edge radiating from that corner (usually 1-2).

(5) A flatwise drop on one of the smallest faces (usually end 5 or 6).

(6) A flatwise drop on the opposite smallest face.

(7) A flatwise drop on one of the medium faces (usually side 2 or 4).

(8) A flatwise drop on the opposite medium face.

(9) A flatwise drop on one of the largest faces (usually top 1 or bottom 3).

(10) A flatwise drop on the opposite large face.

(d) This completes one cycle of ten drops. Commence the next cycle with a drop on the corner diagonally opposite through the box to the corner on which the first drop was made, on corner 3-4-6. Commence the third cycle of ten drops with corner 1-4-5. Each loaded container must withstand 3 cycles without spilling or sifting of contents.

§ 178.224 Specification 21C; fiber drum.

§ 178.224-1 Construction requirements.

(a) Parts and dimensions as follows:

(1) Drums for dry products; minimum requirements unless otherwise stated:

Net weight of contents (pounds) (not over)	Capacity, maximum (gallons) (not over)	Diameter, inside maximum (inches)	Sidewall strength (pounds) ^{1,2}	Tops and bottoms				
				Fiber ³		Steel	Wood (thickness, inches)	
				Thickness (inches)	Strength ¹	(U.S. gauge)	Solid ^{4,5,6}	Plywood at least 3-ply construction
60.....	5	11¼	500	0.090	600	28	1316	311
60.....	20	18½	600	.120	800	28	1316	310
115.....	20	18½	700	.120	800	26	1316	38
115.....	55	23	800	.160	1100	26	1316	16
250.....	55	23	900	.200	1200	24	1316	16
400.....	75	23	1000	.220	1300	24	1316	16

¹ *Mullen or Cady Test.* Either of the following test methods may be used. When more than single ply, test shall be determined from the summation of the tests of individual plies; or, when test is made on a complete drum, the punctures shall be made from the exterior to the interior surface in which case the values for sidewall shall be not less than 80 percent of the value in the above table and the values for fiber tops and bottoms shall be not less than the value in the above table. There shall be a minimum of six tests and the average shall be not less than the prescribed minimum requirements.

² *Sidewalls.* Sidewalls to be convolutely wound of fiberboard at least 0.012 inch thick the plies being secured together with adhesives; or may consist of an outer shell and an inner tube each convolutely wound with each fiberboard ply not less than 0.012 inch thick and secured together with adhesive. Drums may contain barrier or lining materials.

³ When made of 2 or more discs, the discs must be fastened together with adhesive.

⁴ Joints in head must be Linderman joints, glued, except as specified in footnote 5.

⁵ Wooden heads at least one-half inch thick having kraft paper glued on both sides at all contact areas with water-resistant adhesive are authorized provided tests prescribed in § 178.224-2 are successful. Joints of any type are authorized.

⁶ Minimum thickness may be reduced to 25/32 inch for lumber dressed two sides.

§ 178.224-2 Type tests.

(a) **Conditioning:** Prior to testing, drums shall be conditioned at 50 percent relative humidity plus or minus 2 percent and 75° F. plus or minus 3° F. for at least 48 hours.

(b) **Drop tests:** Samples taken at random filled with dry finely powdered material to authorized net weight and closed as for use must withstand the following four foot drop tests on the part specified without leakage or serious rupture. No single drum shall be subjected to more than one of the following tests. Drums with wood heads shall be dropped with grain of wood in cover parallel to concrete surface.

(1) Top chime, diagonally onto solid concrete.

(2) Bottom chime, diagonally onto solid concrete.

(3) Sidewall, over a 2-inch x 6-inch timber resting on solid concrete with 6-inch leg vertical; drop to be made with drum in the horizontal position at right angles to the timber.

(4) The closure or on any other part which may be considered weaker onto solid concrete.

(c) **Compression test:** An empty drum shall withstand either of the following compression tests, in accordance with the following table, without buckling of the sidewalls sufficient to cause damage to its expected contents; but in no case shall the maximum deflection be more than one inch.

Maximum net weight	Maximum capacity (gallons)	Maximum inside diameter (inches)	Compression (pounds)	
			Static ¹	Dynamic ²
60	5	11 ¹ / ₄	1200	1600
60	20	18 ¹ / ₂	1200	1600
115	20	18 ¹ / ₂	1200	1600
115	55	23	1500	2000
250	55	23	1800	2400
400	75	23	2100	2800

¹ **Static Test.** Compression as specified must be applied to full area of top cover of drum for period of 48 hours.

² **Dynamic Test.** Compression as specified must be applied end to end. Speed of compression tester to be one-half inch plus or minus one-fourth inch per minute.

§ 178.224-3 Registration of drum specification.

(a) Specification for each type of drum manufactured (under this specification) shall be filed with the Bureau of Explosives. Changes in construction (drum and closure) differing from specification thus filed must be approved by the Bureau of Explosives before authorized for use.

§ 178.224-4 Marking.

(a) On each container as follows:

(1) Drums for dry products must be marked DOT-21C followed by the authorized net weight to which drum was constructed, for example, DOT-21C115.

(2) Name or symbol of person making the marks specified in paragraph (a) (1) of this section and located just above, below, or following those marks. Symbol, if used, must be registered with the Bureau of Explosives.

§ 178.225 Specification 21P; fiber drum overpack for inside plastic container.

§ 178.225-1 Compliance.

(a) Required in all details.

§ 178.225-2 Construction requirements.

(a) Fiber drum overpack for inside plastic containers as prescribed in Part 73 of this chapter. Fit of fiber drum overpack shall provide support for inside plastic container in such manner as to avoid wrinkling, buckling, or suspension of inside plastic container by any closure protruding through top head.

(b) Fiber sidewalls shall consist of one or more multiple-ply shells or tubes, convolutely wound of fiberboard at least 0.012 inch thickness with plies of each component secured together with adhesive: steel parts used shall be of low carbon, open hearth, or electric steels; drum overpack shall be of tight-head or full removable cover type, straight sided, with top and bottom heading secured to sidewall by an efficient means in accordance with the following detailed minimum requirements:

Fiber drum overpack parts ^{1 2}									
Marked ¹ (rated capacity of inside plastic container not over (gallons))	Authorized maximum net weight of liquid contents not over (pounds)	Sidewall	Top heads and bottom heads				Combination fiber-steel bottoms		
		Strength ² (pounds)	All fiber ³		All steel		Fiber component		Steel component
			Thick- ness (inch)	Strength ² (pounds)	Gauge	Thick- ness ⁴ (inch)	Thick- ness (inch)	Strength ² (pounds)	Thick- ness ⁴ (inch)
6 1/2	105	600	0.120	800	28	0.0129			
15	245	700	.160	1,100	26	.0159	0.090	600	28
30	350	900	.200	1,200	24	.0200	.120	800	26
30	450	1,000	.220	1,300	24	.0209	.160	1,100	26
55	600	1,200	.240	1,500	24	.0209	.160	1,100	26

¹ For capacity tolerances refer to applicable specifications of inside plastic containers.

² Mullen or Cady test. Either of the following test methods may be used. When more than single ply, test shall be determined from the summation of the tests of individual plies; or when test is made on a complete drum, the punctures shall be made from the exterior to the interior surface, in which case the values for sidewall shall be not less than 80 percent of the value in the above table and the values for fiber tops and bottoms shall be not less than the value in the above table. There shall be a minimum of 6 tests and the average shall be not less than the prescribed minimum requirements.

³ When made of 2 or more discs, the discs must be bonded together with adhesive.

⁴ Thickness shall be measured at any point on the steel part not less than 3/4 inch from an edge.

⁵ Two holes not exceeding 1/8 inch each are permitted diametrically opposite each other in the overpack body and three holes not exceeding 3/16 inch in diameter on centers 120 degrees apart in the bottom head. Top head may have not more than 2 holes of suitable size to provide for protruding closures. Closures shall not protrude above plane of top chime.

⁶ Overpack interior shall be free of projections, burrs, or any edges that might cause damage to inside plastic container.

§ 178.225-3 Marking.

(a) Maker of overpack and assembler of the composite container shall place a marking on side of container by printing, lithography or stamping with weather resistant ink in letters not less than 1/2 inch high as follows:

(1) Marking by maker of overpack.

(i) DOT-21P***; stars to be replaced by the authorized net weight for liquid products for which drum was constructed, for example, DOT-21P/450.

(ii) Name or symbol of maker must be registered with the Bureau of Explosives and be located just above, below, or following the mark specified in subparagraph (a) (1) (i) of this section.

(2) Marking by assembler of composite container.

(i) Maker or other party assuming responsibility for compliance with specification requirements shall add a marking to the overpack marker's marking as specified by subparagraph (a) (1) (i) of this section identifying the inside plastic container specification number. For example, DOT-21P/450/2SL. "STC" shall be added to the marking when inside container is authorized only for single trip service. For example, DOT-21P/450/2U STC.

(ii) The name or symbol of the assembler to be located near the marking spec-

ified in subparagraph (a) (2) (i) of this section; symbol must be registered with the Bureau of Explosives.

§ 178.225-4 Compression test.

(a) Prior to testing, drums shall be conditioned at 50 percent plus or minus 2 percent relative humidity and 75° F. plus or minus 3° F. for at least 48 hours.

(b) An empty fiber drum overpack shall withstand either of the following compression tests without buckling of the sidewall sufficient to cause damage, but in no case shall the maximum top to bottom deflection be more than 1/2 inch:

Fiber drum overpack for plastic inside container of marked (rated) capacity not over (gallons)	Compression	
	Static ¹ (pounds)	Dynamic ² (pounds)
15	1,125	1,500
30	1,800	2,400
55	2,400	3,200

¹ Static test. Compression as specified must be applied to entire bearing surface of top of drum for a period of 48 hours.

² Dynamic test. Compression as specified must be applied end to end. Speed of compression tester to be 1/2 inch plus or minus 1/4 inch per minute.

(c) Test to be made at start of production and repeated at 4-month intervals for each size of each type drum overpack manufactured. Record of test results shall be maintained in current status by each manufacturer at each producing plant.

§ 178.225-5 Assembly and testing of composite container.

(a) The method employed for assembly shall be such as not to cause damage to either component.

(b) The party doing assembly shall be responsible for compliance with § 178.225-2(a) and for compliance with test requirements specified by applicable inside plastic container specifications in Part 178.

§ 178.226 Specification 29: mailing tubes.

§ 178.226-1 Compliance.

(a) Required in all details.

§ 178.226-2 Cushioning.

(a) Inside containers, if any, must fit closely in tube or be properly cushioned.

§ 178.226-3 Construction.

(a) Of fiber at least $\frac{1}{8}$ " thick; metal bottom and metal screw-cap top, or telescope type with fixed metal ends.

§ 178.226-4 Marking.

(a) Each container must be marked to show:

(1) DOT-29.

(2) The name or symbol of person making the mark specified in paragraph (a)(1) of this section. Symbol, if used, must be registered with the Bureau of Explosives.

Subpart G—Specifications for Bags, Cloth, Burlap, Paper or Plastic

§ 178.230 Specification 36A: lined cloth bags (triplex).

§ 178.230-1 Compliance.

(a) Required in all details.

§ 178.230-2 Capacity.

(a) Not over 100 pounds, net.

§ 178.230-3 Cloth.

(a) Osnaburg cotton cloth at least $8\frac{1}{2}$ ounces per square yard.

NOTE 1: Because of the present emergency and until further order of the Department, cloth of 40-inch width, 2.11 yards per pound, may be used, provided creped paper is of two-way stretch construction.

§ 178.230-4 Paper.

(a) Shipping sack Kraft, creped. A "ream" as used herein means 500 sheets 24 inches by 36 inches before creping.

§ 178.230-5 Assembly.

(a) Either of the following:

(1) *Single bag.* Cloth-lined with 2 sheets of creped paper, each at least 35 pounds per ream, cemented together and to cloth. Combined tensile strength at least 100 pounds, warp and fill.

(2) *Triple bag.* Outer of cloth; intermediate of 2 thicknesses of creped paper, each at least 30 pounds per ream, cemented together with asphalt so as to weigh 90 pounds per ream; inner of creped paper at least 45 pounds per ream.

§ 178.230-6 Seams.

(a) To be dust-tight.

§ 178.230-7 Test.

(a) The finished container, filled and closed as for shipment, must be capable of withstanding drop test of 4 feet without sifting.

§ 178.230-8 Marking.

(a) Marking on each container by marks at least 1" high as follows:

(1) DOT-36A.

(2) Name and address or symbol of person making the mark specified in paragraph (a)(1) of this section and located just above or below that mark. Symbol, if used, must be registered with the Bureau of Explosives.

§ 178.230-9 Closing for shipment.

(a) By double tying with steel wires at least No. 16 Birmingham wire gauge; inner bags, if any, to have edges rolled in before outer bag is tied.

§ 178.233 Specification 36B: burlap bags, lined.

§ 178.233-1 Compliance.

(a) Required in all details.

§ 178.233-2 Capacity.

(a) Not over 100 pounds, net.

§ 178.233-3 Burlap.

(a) At least equal in quality and strength to 10-oz., 40" (10/40), Calcutta A and/or B mill grade. Thread count at least 11 per 37/40", porter, and 12 per inch, shot; this to be an average of 6 counts.

§ 178.233-4 Paper.

(a) Shipping sack Kraft, creped; at least 25 pounds per ream (500 sheets 24" x 36") before creping.

§ 178.233-5 Assembly.

(a) Burlap to be lined with 2 sheets of creped paper cemented together and to burlap.

(b) Adhesive between paper sheets to be asphalt, melting point 150° F., at minimum rate of 110 pounds per ream.

(c) Adhesive between paper and burlap to be either:

(1) Curing rubber latex at minimum rate of 40 pounds, dry weight, per ream.

(2) Asphalt, any desirable type, at minimum rate of 110 pounds per ream.

§ 178.233-6 Stretch of paper lining.

(a) At least equal to that of burlap in direction of warp and fill and equal to 10-percent in diagonal direction.

§ 178.233-7 Seams.

(a) By cementing or taping to give seam strength at least equal to that of bag material and prevent sifting.

§ 178.233-8 Tests.

(a) The finished container, filled and closed as for shipment, must be capable of withstanding drop test of 4 feet on the butt without sifting or rupture of burlap or liners.

§ 178.233-9 Marking.

(a) Marking on each container by marks at least 1" high as follows:

(1) DOT-36B.

(2) Name and address or symbol of person making the mark specified in paragraph (a)(1) of this section and located just above or below that mark. Symbol, if used, must be registered with the Bureau of Explosives.

§ 178.233-10 Closing for shipment.

(a) As specified for seams, § 178.233-7; or, by tying with 2 steel wires of at least No. 16 Birmingham wire gauge.

§ 178.234 Specification 36C: burlap bags, paper lined.

§ 178.234-1 Compliance.

(a) Required in all details.

§ 178.234-2 Capacity.

(a) Not over 100 pounds, net.

§ 178.234-3 Burlap.

(a) At least equal in quality and strength to 7½ ounce, 40 inch (7½/40) Calcutta A and/or B mill grade. Thread count at least 9 per 37/40 inch, porter, and 9 per inch, shot; this to be an average of 6 counts.

§ 178.234-4 Paper.

(a) Shipping sack Kraft, creped; at least 30 pounds per ream (500 sheets 24" x 36") before creping.

§ 178.234-5 Assembly.

(a) Burlap to be lined with 1 sheet of creped paper cemented to the burlap.

(b) Adhesive between paper and burlap to be asphalt, any desirable type, at a minimum rate of 110 pounds per ream.

§ 178.234-6 Stretch of paper lining.

(a) At least equal to that of burlap in direction of warp and fill and equal to 10 percent in diagonal direction.

§ 178.234-7 Seams.

(a) By cementing or taping to give seam strength at least equal to that of bag material and prevent sifting.

§ 178.234-8 Test.

(a) The finished container, filled and closed as for shipment, must be capable of withstanding drop test of 4 feet on the butt without sifting or rupture of burlap liners.

§ 178.234-9 Marking.

(a) Marking on each container by marks at least 1" high as follows:

(1) DOT-36C.

(2) Name and address or symbol of person making the mark specified in paragraph (a)(1) of this section and located just above or below that mark.

Symbol, if used, must be registered with the Bureau of Explosives.

§ 178.234-10 Closing for shipment.

(a) As specified for seams, § 178.234-7; or by tying with 2 steel wires of at least No. 16 Birmingham wire gauge, or any other type of equal efficiency that will be sift-proof and insure equal strength to body of bag.

§ 178.236 Specification 44B; multiwall paper bags.

§ 178.236-1 Compliance.

(a) Required in all details.

§ 178.236-2 Paper.

(a) Shipping sack kraft paper, plain, or extensible plain, shall conform to the average requirements specified in paragraph (a) (1) or (2) of this section.

(1) Shipping sack, kraft paper, plain: ¹

Nominal basis weight (500 sheets, 24" x 36") ²	Minimum average dry tearing strength		Minimum average dry tensile strength per inch width	
	M.D. ³	Total M.D. plus C.D. ³	C.D. ³	Total C.D. plus M.D. ³
Pounds:	Grams	Grams	Pounds	Pounds
40.....	88	188	14	41
50.....	110	235	19	53
60.....	132	282	23	64
70.....	154	329	27	74

¹ Shipping sack kraft paper, plain, is paper that consists of all sulphate pulp and no other fiber, and which has not been treated by coloring, bleaching, creping, coating, spraying, laminating, or impregnating for special qualities. Paper shall have a degree of water resistance as secured by normal rosin sizing and shall comply with the requirements in paragraph (a)(1) of this section.

² A tolerance of minus 10 percent of the basis weight of individual plies of plain shipping sack kraft paper will be permitted; an average tolerance of minus 5 percent will be permitted in the sum total basis weight of all plies in multiwall constructions. Variations in excess of specified basis weights will not be considered a defect or deviation. The basis weight of paper means the basis weight as produced by the paper machine, not including finish subsequently applied, such as coating or printing.

³ M.D. means machine direction. C.D. means cross direction.

(2) Shipping sack, extensible kraft paper, plain: ¹

Nominal basis weight (500 sheets, 24" x 36") ²	Minimum dry tearing strength		Minimum tensile energy absorption (ft./lbs. per square foot of paper)	
	M.D. ³	Total M.D. plus C.D. ³	C.D. ³	Total C.D. plus M.D. ³
Pounds:	Grams	Grams		
40.....	88	188	4.5	14.0
50.....	110	235	5.6	17.0
60.....	132	282	7.0	20.0
70.....	154	329	8.0	23.0
80.....	176	376	9.0	26.0

¹ Extensible shipping sack kraft paper, plain, is paper that consists of all sulphate pulp and no other fiber, and which has not been treated by coloring, bleaching, creping, coating, spraying, laminating or impregnating for special qualities. Paper shall have a degree of water resistance as secured by normal rosin sizing, and shall comply with the requirements in paragraph (a)(2) of this section.

² A tolerance of minus 10 percent of the basis weight of individual plies of extensible shipping sack kraft paper will be permitted; an average tolerance of minus 5 percent will be permitted in the sum total basis weight of all plies in multiwall constructions. Variations in excess of specified basis weights will not be considered a defect or deviation. The basis weight of paper means the basis weight as produced by the paper machine not including finish subsequently applied, such as coating or printing.

³ M.D. means machine direction. C.D. means cross direction.

⁴ Variations in cross-direction tensile energy absorption of not more than 0.5 units below the minimum requirements will be permitted, provided the variations are compensated by an increase in the machine-direction tearing strength in the ratio of twenty units of tearing strength to one unit of tensile energy absorption, and variations in total tensile energy absorption of not more than one unit below the minimum requirements will be permitted, provided the variations are compensated by an increase in the total tearing strength in the same ratio. Similarly, variations in machine-direction tearing strength of not more than ten units below minimum requirements will be permitted, provided variations are compensated by an increase in cross-direction tensile energy absorption in the ratio of one unit of tensile energy absorption to twenty units of tearing strength; and variations in total tearing strength of not more than twenty units below the minimum requirements will be permitted, provided the variations are compensated by an increase in the total tensile energy absorption in the same ratio. Conformance with the requirements of Table shall be established by comparing the sum of the basis weights and tests for all of the plies specified in the construction of the bag, with the sum of the specified basis weights and tests for the respective papers comprising the different plies. All requirements in this table are for a paper conditioned to a relative humidity of 50 percent at a temperature of 23° C (73° F).

(b) Asphalt laminated or polyethylene coated shipping sack kraft paper when used shall comply with the following requirements:

Type paper	Minimum average dry tearing strength		Minimum average dry tensile strength per inch width		Heat resistance hours at 150° F. without impairing function of sack	Maximum average water-vapor permeability from both sides at 50 percent R.H. and 73° F. g/m. 2/24 hours	
	M.D.	Total M.D. plus C.D.	C.D.	Total C.D. plus M.D.		Un-creased	Creased ¹
	<i>Grams</i>	<i>Grams</i>	<i>Pounds</i>	<i>Pounds</i>			
Asphalt laminated ^{2 4}	110	235	19	53	5	9.0	15.0
10PE-50 1/50-10PE ³	110	235	19	53	5	7.0	12.0
15PE-50 1/50-15PE ³	110	235	19	53	5	4.5	7.5

¹ Creasing at 40° F.

² Asphalt laminated kraft paper when used as a wall in fabricated sacks, shall conform to the requirements of paragraph (b) of this section and shall consist of two sheets of kraft paper, the total basis weight of the two paper plies not less than 50 pounds per ream (500 sheets, 24" x 36"), continuously and uniformly laminated together with an average of not less than 25 pounds of asphalt per ream (500 sheets, 24" x 36"). Tolerance of minus 5 percent will be allowed on individual components. The total basis weight of the finished combination shall not exceed 100 pounds per ream (500 sheets, 24" x 36"). An asphalt laminated kraft wall meeting these requirements may be substituted for a plain kraft wall of 50 pounds basis or less, provided it meets the specification.

³ Polyethylene-coated shipping sack kraft paper. The polyethylene-coated kraft paper when used as walls in fabricated sacks shall meet the heat resistance and water-vapor permeability requirements as specified in the table. A tolerance of minus 10 percent will be allowed for the lot sample average coating weight of polyethylene on shipping sack kraft paper. Minimum samples for testing shall comprise not less than 3 specimens 16 square inches each selected representatively from each polyethylene-coated wall of each sack in the lot sample. When barrier sheets are based on extensible kraft the weight of the barrier material shall be in addition to the basis weight of the paper.

⁴ Asphalt laminated extensible kraft paper must consist of two sheets of extensible kraft paper, the total basis weight of the paper in the finished combination being not less than 50 pounds per ream (24 x 36—500) with neither sheet weighing less than 23 pounds continuously and uniformly laminated together, with an average of not less than 25 pounds of asphalt per ream (24 x 36—500). In determining the basis weight and test conformance of bags containing an asphalt laminated extensible kraft wall, the asphalt laminated extensible kraft wall shall be treated as if it were a single extensible kraft wall or combination of walls of 10 pounds lower total paper basis weight than the sum of the nominal basis weight in the asphalt laminated wall, but in no case shall be treated as less than the equivalent of a 50 pounds basis weight wall.

(c) Laminating materials: Any laminant other than asphalt or other water-vapor barrier walls may be used provided they meet the requirements in paragraph (b) of this section.

(d) All values in paragraphs (a) and (b) of this section are for paper having a moisture content in equilibrium with an atmosphere having a relative humidity of 50 percent plus or minus 2 percent at a temperature of 73° F. plus or minus 3.5° F. following preconditioning of the test specimens to a moisture content between 3 and 5.5 percent by exposure to relatively dry air having a temperature no greater than 140° F.

(e) Conformance of sacks with paper strength requirements shall be established by comparing the sums of the test values for all the walls of the new and unused sack with the sums of the respec-

tive strength values specified in paragraphs (a) and (b) of this section for the different walls of the sack by a method acceptable to the Bureau of Explosives.

(1) Variation in cross direction dry tensile strength of not more than 2 units below the minimum requirement based on paragraphs (a) and (b) of this section will be permitted for each wall of the sack, provided the variation is compensated for by a machine direction tearing strength test value in excess of the minimum requirement obtained from the tables, in the ratio of 5 units of tearing strength for each unit of dry tensile strength test below the minimum requirement; and variation in combined dry tensile strength of not more than 4 units below the minimum requirement based on paragraphs (a) and (b) of this

section will be permitted for each wall used provided the variation is compensated for by a combined tearing strength test value in excess of the minimum requirement obtained from the tables in the ratio of 5 units of combined tearing strength for each unit of dry tensile strength test below the minimum requirement. Similarly, variation in machine direction tearing strength of not more than 10 units below the minimum requirement will be permitted for each wall, provided the variation is compensated for by a cross direction dry tensile strength test value in excess of the minimum requirement obtained from the tables in the ratio of 1 unit of dry tensile strength for each 5 units of tearing strength test below the minimum requirement; and variation in combined tearing strength of not more than 20 units below the minimum requirement obtained from the tables will be permitted for each wall provided the variation is compensated for by a combined dry tensile strength test value in excess of the minimum requirement obtained from the tables in the ratio of 5 units of tearing strength for each unit of dry tensile strength below the minimum requirement.

§ 178.236-3 Construction.

(a) Bags must be at least 4 thicknesses of paper; this must be heavy duty shipping sack kraft paper, conforming to the requirements of § 178.236-2(a) and (b) or equivalent, with a minimum total basis weight of 200 pounds of paper (500 sheets, 24" x 36"). Outer sheet must be of water-resistant stock and at least 60 pounds basis weight, inner sheets not less than 40 pounds basis weight. Bags to be of "satchel bottom" construction; bottoms to be reinforced with a kraft paper patch at least 30 pounds basis weight. Other bottoms of equal efficiency are authorized.

(b) Or, bags must be at least 2 thicknesses of paper; this must be heavy duty shipping sack kraft paper, or equivalent with a minimum total basis weight of 110 pounds (500 sheets, 24" x 36"), fas-

tened together with waterproof composition reinforced with jute, sisal, cotton, or other yarn or cord imbedded in the composition and criss-crossed at intervals of not over $\frac{1}{2}$ ", approximately so as to give approximately the same tensile strength for both width and length. Bags to be of "satchel bottom" construction. Other bottoms of equal efficiency are authorized.

(c) Moistureproof barrier sheets of paper, if used, must meet the requirements of § 178.336-2(b) and shall be considered as one thickness of paper and shall be counted as 50 pounds basis weight (500 sheets, 24" x 36").

§ 178.236-4 Adhesive.

(a) Moisture resistant adhesive must be used on all seams, joints, and bottom patch, if any.

§ 178.236-5 Closure.

(a) For 4-ply bags: Inner (fourth) ply to be diamond folded loose; the third ply to be diamond folded and silicated across all its overlapping folds; the two outer plies to be diamond folded, and cross sealed, front to back and side to side, with gummed tape extending at least 2 inches down sides of bag; sealing tape must be 4" wide, of No. 1 Kraft paper, 90 pounds basis weight (500 sheets, 24" x 36"), or equivalent, and having a Mullen or Cady test, of not less than 90 percent of basis weight. Other closures of equal efficiency are authorized.

(b) For all bags: Any closure for the top which is equal in efficiency to that of the bottom, is authorized.

§ 178.236-6 Tests for shipment.

(a) Bags as prepared for shipment must be able to withstand four 4-foot drops, one on each end and one each on opposite sides, without sifting or rupture.

§ 178.236-7 Marking.

(a) Marking on each bag with letters and figures at least $\frac{1}{2}$ inch high in rectangle as follows:

DOT-44B

(b) Each bag must also be marked with the name and address or symbol of the person making the mark specified in paragraph (a) of this section and be located just above or below that mark. Symbol, if used, must be registered with the Bureau of Explosives.

§ 178.237 Specification 44C; multiwall paper bags.

§ 178.237-1 Compliance.

(a) Required in all details.

§ 178.237-2 Paper.

(a) Shipping sack kraft paper, plain, or extensible plain, shall conform to the average requirements specified in paragraphs (a) (1) or (a) (2) of this section.

(1) Shipping sack, kraft paper, plain: ¹

Nominal basis weight (500 sheets, 24" x 36") ²	Minimum average dry tearing strength		Minimum average dry tensile strength per inch width	
	M.D. ³	Total M.D. plus C.D. ³	C.D. ³	Total C.D. plus M.D. ³
Pounds:	Grams	Grams	Pounds	Pounds
40-----	88	188	14	41
50-----	110	235	19	53
60-----	132	282	23	64
70-----	154	329	27	74

¹ Shipping sack kraft paper, plain, is paper that consists of all sulphate pulp and no other fiber, and which has not been treated by coloring, bleaching, creping, coating, spraying, laminating, or impregnating for special qualities. Paper shall have a degree of water resistance as secured by normal rosin sizing and shall comply with the requirements in paragraph (a) (1) of this section.

² A tolerance of minus 10 percent of the basis weight of individual plies of plain shipping sack kraft paper will be permitted; an average tolerance of minus 5 percent will be permitted in the sum total basis weight of all plies in multiwall constructions. Variations in excess of specified basis weights will not be considered a defect or deviation. The basis weight of paper means the basis weight as produced by the paper machine, not including finish subsequently applied, such as coating or printing.

³ M.D. means machine direction. C.D. means cross direction.

(2) Shipping sack, extensible kraft paper, plain: ¹

Nominal basis weight (500 sheets, 24" x 36") ²	Minimum dry tearing strength		Minimum tensile energy absorption ft./lbs. per square foot of paper	
	M.D. ³	Total M.D. plus C.D. ³	C.D. ³	Total C.D. plus M.D. ³
Pounds:	Grams	Grams		
40-----	88	188	4.5	14.0
50-----	110	235	5.6	17.0
60-----	132	282	7.0	20.0
70-----	153	329	7.0	23.0
80-----	176	376	9.0	26.0

¹ Extensible shipping sack kraft paper, plain, is paper that consists of all sulphate pulp and no other fiber, and which has not been treated by coloring, bleaching, creping, coating, spraying, laminating or impregnating for special qualities. Paper shall have a degree of water resistance as secured by normal rosin sizing, and shall comply with the requirements in paragraph (a) (2) of this section.

² A tolerance of minus 10 percent of the basis weight of individual plies of extensible shipping sack kraft paper will be permitted; an average tolerance of minus 5 percent will be permitted in the sum total basis weight of all plies in multiwall constructions. Variations in excess of specified basis weights will not be considered a defect or deviation. The basis weight of paper means the basis weight as produced by the paper machine not including finish subsequently applied, such as coating or printing.

³ M.D. means machine direction. C.D. means cross direction.

⁴ Variations in cross-direction tensile energy absorption of not more than 0.5 units below the minimum requirements will be permitted, provided the variations are compensated by an increase in the machine-direction tearing strength in the ratio of twenty units of tearing strength to one unit of tensile energy absorption, and variations in total tensile energy absorption of not more than one unit below the minimum requirements will be permitted, provided the variations are compensated by an increase in the total tearing strength in the same ratio. Similarly, variations in machine-direction tearing strength of not more than ten units below minimum requirements will be permitted, provided variations are compensated by an increase in cross-direction tensile energy absorption in the ratio of one unit of tensile energy absorption to twenty units of tearing strength; and variations in total tearing strength of not more than twenty units below the minimum requirements will be permitted, provided the variations are compensated by an increase in the total tensile energy absorption in the same ratio. Conformance with the requirements of Table shall be established by comparing the sum of the basis weights and tests for all of the plies specified in the construction of the bag, with the sum of the specified basis weights and tests for the respective papers comprising the different plies. All requirements in this table are for a paper conditioned to a relative humidity of 50 percent at a temperature of 23° C (73° F).

(b) Asphalt laminated or polyethylene coated shipping sack kraft paper when used shall comply with the following requirements:

Type paper	Minimum average dry tearing strength		Minimum average dry tensile strength per inch width		Heat resistance hours at 150° F without impairing function of sack	Maximum average water-vapor permeability from both sides at 50 percent R.H. and 73° F g/m, 2/24 hours	
	M.D.	Total M.D. plus C.D.	C.D.	Total C.D. plus M.D.		Un-creased	Creased ¹
	Grains*	Grains*	Pounds	Pounds			
Asphalt laminated 24".....	110	235	10	3	5	9.0	15.0
10 P.E. 50 1:50-10 P.E. 3.....	110	235	10	33	5	7.0	12.0
15 P.E. 50 1:50-15 P.E. 3.....	110	235	10	33	5	4.5	7.5

¹ Creasing at 40° F.

Asphalt laminated kraft paper when used as a wall in fabricated sacks, shall conform to the requirements of paragraph (b) of this section and shall consist of two sheets of kraft paper, the total basis weight of the two paper plus not less than 50 pounds per ream (500 sheets, 24" x 36") continuously and uniformly laminated together with an average of not less than 25 pounds of asphalt per ream (500 sheets, 24" x 36"). Tolerance of minus 5 percent will be allowed on individual components. The total basis weight of the finished combination shall not exceed 100 pounds per ream (500 sheets, 24" x 36"). An asphalt laminated kraft wall meeting these requirements may be substituted for a plain kraft wall of 50 pounds basis or less, provided it meets the specification.

Polyethylene-coated shipping sack kraft paper. The polyethylene-coated kraft paper when used as walls in fabricated sacks shall meet the heat resistance and water-vapor permeability requirements as specified in the table. A tolerance of minus 10 percent will be allowed for the lot sample average coating weight of polyethylene on shipping sack kraft paper. Minimum samples for testing shall comprise not less than 3 specimens 16 square inches each selected representatively from each polyethylene-coated wall of each sack in the lot sample. When barrier sheets are based on extensible kraft, the weight of the barrier material shall be in addition to the basis weight of the paper.

Asphalt laminated extensible kraft paper must consist of two sheets of extensible kraft paper, the total basis weight of the paper in the finished combination being not less than 50 pounds per ream (24 x 36-500) with neither sheet weighing less than 25 pounds continuously and uniformly laminated together, with an average of not less than 25 pounds of asphalt per ream (24 x 36-500). In determining the basis weight and test conformance of bags containing an asphalt laminated extensible kraft wall, the asphalt laminated extensible kraft wall shall be treated as if it were a single extensible kraft wall or combination of walls of 10 pounds lower total paper basis weight than the sum of the nominal basis weight in the asphalt laminated wall, but in no case shall be treated as less than the equivalent of a 50 pounds basis weight wall.

(c) Laminating materials: Any laminant other than asphalt or other water-vapor barrier walls may be used provided they meet the requirements in paragraph (b) of this section.

(d) All values in paragraphs (a) and (b) of this section are for paper having a moisture content in equilibrium with an atmosphere having a relative humidity of 50 percent plus or minus 2 percent at a temperature of 73° F. plus or minus 3.5° F. following preconditioning of the test specimens to a moisture content between 3 and 5.5 percent by exposure to relatively dry air having a temperature no greater than 140° F.

(e) Conformance of sacks with paper strength requirements shall be established by comparing the sums of the test values for all the walls of the new and unused sack with the sums of the respective strength values specified in paragraphs (a) and (b) of this section for the respective papers specified for the different walls of the sack by a method acceptable to the Bureau of Explosives.

(1) Variation in cross direction dry tensile strength of not more than 2 units below the minimum requirement based

on paragraphs (a) and (b) of this section will be permitted for each wall of the sack, provided the variation is compensated for by a machine direction tearing strength test value in excess of the minimum requirement obtained from the tables, in the ratio of 5 units of tearing strength for each unit of dry tensile strength test below the minimum requirement; and variation in combined dry tensile strength of not more than 4 units below the minimum requirement based on paragraphs (a) and (b) of this section will be permitted for each wall used provided the variation is compensated for by a combined tearing strength test value in excess of the minimum requirement obtained from the tables in the ratio of 5 units of combined tearing strength for each unit of dry tensile strength test below the minimum requirement. Similarly, variation in machine direction tearing strength of not more than 10 units below the minimum requirement will be permitted for each wall, provided the variation is compensated for by a cross direction dry tensile strength test value in excess of the minimum requirement obtained from the

tables in the ratio of 1 unit of dry tensile strength for each 5 units of tearing strength test below the minimum requirement; and variation in combined tearing strength of not more than 20 units below the minimum requirement obtained from the tables will be permitted for each wall provided the variation is compensated for by a combined dry tensile strength test value in excess of the minimum requirement obtained from the tables in the ratio of 5 units of tearing strength for each unit of dry tensile strength below the minimum requirement.

§ 178.237-3 Construction.

(a) Bags must be at least 4 thicknesses of paper; this must be heavy duty shipping sack kraft paper conforming to the requirements of § 178.237-2 paragraphs (a) and (b), or equivalent, with a minimum total basis weight of 250 pounds of paper (500 sheets, 24" x 36"). Outer sheet must be of water resistant stock and at least 60 pounds basis weight, inner sheets not less than 40 pounds basis weight. Bags to be of sewn, sift-proof bottom construction. Other bottoms of equal efficiency authorized.

(b) Moistureproof barrier sheets of paper, if used, must meet the requirements of § 178.237-2(b) and shall be considered as one thickness of paper and shall be counted as 50 pounds basis weight (500 sheets, 24" x 36").

§ 178.237-4 Adhesive.

(a) Moisture resistant adhesive must be used on all seams, joints, and bottom patch, if any.

§ 178.237-5 Closure.

(a) For all bags: Any closure for the top which is equal in efficiency to that of the bottom, is authorized.

§ 178.237-6 Tests for shipment.

(a) Bags as prepared for shipment must be able to withstand four 4-foot drops, one on each end and one each on opposite sides, without sifting or rupture.

§ 178.237-7 Marking.

(a) On each bag with letters and figures at least ½ inch high in rectangle as follows:

DOT-44C

(b) Each bag must also be marked with the name and address or symbol of the person making the mark specified in paragraph (a) of this section and be located just above or below that mark. Symbol, if used, must be registered with the Bureau of Explosives.

§ 178.238 Specification 44D; multiwall paper bags.

§ 178.238-1 Compliance.

(a) Required in all details.

§ 178.238-2 Paper.

(a) Shipping sack kraft paper, plain, or extensible plain, shall conform to the average requirements specified in subparagraphs (a)(1) and (a)(2) of this paragraph.

(1) Shipping sack, kraft paper, plain:¹

Nominal basis weight (500 sheets, 24" x 36") ²	Minimum average dry tearing strength		Minimum average dry tensile strength per inch width	
	M.D. ³	Total M.D. plus C.D. ³	C.D. ³	Total C.D. plus M.D. ³
Pounds:	Grams	Grams	Pounds	Pounds
40.....	88	188	14	41
50.....	110	235	19	53
60.....	132	282	23	64
70.....	154	329	27	74

¹ Shipping sack kraft paper, plain, is paper that consists of all sulphate pulp and no other fiber, and which has not been treated by coloring, bleaching, creping, coating, spraying, laminating, or impregnating for special qualities. Paper shall have a degree of water resistance as secured by normal rosin sizing and shall comply with the requirements in paragraph (a)(1) of this section.

² A tolerance of minus 10 percent of the basis weight of individual plies of plain shipping sack kraft paper will be permitted; an average tolerance of minus 5 percent will be permitted in the sum total basis weight of all plies in multiwall constructions. Variations in excess of specified basis weights will not be considered a defect or deviation. The basis weight of paper means the basis weight as produced by the paper machine, not including finish subsequently applied, such as coating or printing.

³ M.D. means machine direction. C.D. means cross direction.

⁴ A bleached sulphate kraft outer wall of 70 pounds basis weight will be permitted provided the combined test values of all of the 5 walls of the completed multiwall sack are in conformance with paragraph (e) of this section and § 178.238-3.

(2) Shipping sack, extensible kraft paper, plain:¹

Nominal basis weight (500 sheets, 24" x 36") ²	Minimum dry tearing strength		Minimum tensile energy absorption ft./lbs. per square foot of paper	
	M.D. ³	Total M.D. plus C.D. ³	C.D. ^{3,4}	Total C.D. plus M.D. ^{3,4}
Pounds	Grams	Grams		
40	88	188	4.5	14.0
50	110	235	5.6	17.0
60	132	282	7.0	20.0
70	154	329	8.0	23.0
80	176	376	9.0	26.0

¹ Extensible shipping sack kraft paper, plain, is paper that consists of all sulphate pulp and no other fiber, and which has not been treated by coloring, bleaching, creping, coating, spraying, laminating or impregnating for special qualities. Paper shall have a degree of water resistance as secured by normal rosin sizing, and shall comply with the requirements in paragraph (a)(2) of this section.

² A tolerance of minus 10 percent of the basis weight of individual plies of extensible shipping sack kraft paper

will be permitted; an average tolerance of minus 5 percent will be permitted in the sum total basis weight of all plies in multiwall constructions. Variations in excess of specified basis weights will not be considered a defect or deviation. The basis weight of paper means the basis weight as produced by the paper machine, not including finish subsequently applied, such as coating or printing.

³ M.D. means machine direction. C.D. means cross direction.

⁴ Variations in cross-direction tensile energy absorption of not more than 0.5 units below the minimum requirements will be permitted, provided the variations are compensated by an increase in the machine-direction tearing strength in the ratio of twenty units of tearing strength to one unit of tensile energy absorption, and variations in total tensile energy absorption of not more than one unit below the minimum requirements will be permitted, provided the variations are compensated by an increase in the total tearing strength in the same ratio. Similarly, variations in machine direction tearing strength of not more than ten units below minimum requirements will be permitted, provided variations are compensated by an increase in cross-direction tensile energy absorption in the ratio of one unit of tensile energy absorption to twenty units of tearing strength; and variations in total tearing strength of not more than twenty units below the minimum requirements will be permitted, provided the variations are compensated by an increase in the total tensile energy absorption in the same ratio. Conformance with the requirements of table shall be established by comparing the sum of the basis weights and tests for all of the plies specified in the construction of the bag, with the sum of the specified basis weights and tests for the respective papers comprising the different plies. All requirements in this table are for a paper conditioned to a relative humidity of 50 percent at a temperature of 23° C (73° F).

(b) Asphalt laminated or polyethylene coated shipping sack kraft paper when used shall comply with the following requirements:

Type paper	Minimum average dry tearing strength		Minimum average dry tensile strength per inch width		Heat resistance hours at 150° F. without impairing function of sack	Maximum average water-vapor permeability from both sides at 50 percent R.H. and 73° F. g/m, 2/24 hours	
	M.D.	Total M.D. plus C.D.	C.D.	Total C.D. plus M.D.		Un-creased	Creased ¹
	Grams	Grams	Pounds	Pounds			
Asphalt laminated ^{2,4}	110	235	19	53	5	9.0	15.0
15PE-50 1/50-10PE ³	110	235	19	53	5	7.0	12.0
15PE-50 1/50-15PE ³	110	235	19	53	5	4.5	7.5

¹ Creasing at 40° F.

² Asphalt laminated kraft paper when used as a wall in fabricated sacks, shall conform to the requirements of paragraph (b) of this section and shall consist of two sheets of kraft paper, the total basis weight of the two paper plies not less than 50 pounds per ream (500 sheets, 24" x 36"), continuously and uniformly laminated together with an average of not less than 25 pounds of asphalt per ream (500 sheets, 24" x 36"). Tolerance of minus 5 percent will be allowed on individual components. The total basis weight of the finished combination shall not exceed 100 pounds per ream (500 sheets, 24" x 36"). An asphalt laminated kraft wall meeting these requirements may be substituted for a plain kraft of 50 pounds basis or less, provided it meets the specification.

³ Polyethylene-coated shipping sack kraft paper. The polyethylene-coated kraft paper when used as walls in fabricated sacks shall meet the heat resistance and water-vapor permeability requirements as specified in the table. A tolerance of minus 10 percent will be allowed for the lot sample average coating weight of polyethylene on shipping sack kraft paper. Minimum samples for testing shall comprise not less than 3 specimens 16 square inches each selected representatively from each polyethylene-coated wall of each sack in the lot sample. When barrier sheets are based on extensible kraft, the weight of the barrier material shall be in addition to the basis weight of the paper.

⁴ Asphalt laminated extensible kraft paper must consist of two sheets of extensible kraft paper, the total basis weight of the paper in the finished combination being not less than 50 pounds per ream (24 x 36—500) with neither sheet weighing less than 23 pounds continuously and uniformly laminated together, with an average of not less than 25 pounds of asphalt per ream (24 x 36—500). In determining the basis weight and test conformance of bags containing an asphalt laminated extensible kraft wall, the asphalt laminated extensible kraft wall shall be treated as if it were a single extensible kraft wall or combination of walls of 10 pounds lower total paper basis weight than the sum of the nominal basis weight in the asphalt laminated wall, but in no case shall be treated as less than the equivalent of a 50 pounds basis weight wall.

(c) Laminating materials. Any laminant other than asphalt or other water-vapor barrier walls may be used provided they meet the strength requirements in paragraph (b) of this section.

(d) All values in paragraphs (a) and (b) of this section are for paper having a moisture content in equilibrium with an atmosphere having a relative humidity of 50 percent plus or minus 2 percent at a temperature of 73° F. plus or minus 3.5° F. following preconditioning of the test specimens to a moisture content between 3 and 3.5 percent by exposure to relatively dry air having a temperature no greater than 140° F.

(e) Conformance of sacks with paper strength requirements shall be established by comparing the sums of the test values for all the walls of the new and unused sack with the sums of the respective strength values specified in paragraphs (a) and (b) of this section for the respective papers specified for the different walls of the sack by a method acceptable to the Bureau of Explosives.

(1) Variation in cross direction dry tensile strength of not more than 2 units below the minimum requirements based on paragraphs (a) and (b) of this section will be permitted for each wall of the sack, provided the variation is compensated for by a machine direction tearing strength test value in excess of the minimum requirement obtained from the tables, in the ratio of 5 units of tearing strength for each unit of dry tensile strength test below the minimum requirement; and variation in combined dry tensile strength of not more than 4 units below the minimum requirement based on paragraphs (a) and (b) of this section will be permitted for each wall used provided the variation is compensated for by a combined tearing strength test value in excess of the minimum requirement obtained from the tables in the ratio of 5 units of combined tearing strength for each unit of dry tensile strength test below the minimum requirement. Similarly, variation in machine direction tearing strength of not more than 10 units below the minimum requirement will be permitted for each wall, provided the variation is compensated for by a cross direction dry tensile strength test value in excess of the minimum requirement obtained from the tables in the ratio of 1 unit of dry tensile strength for each 5 units of tearing

strength test below the minimum requirement; and variation in combined tearing strength of not more than 20 units below the minimum requirement obtained from the tables will be permitted for each wall provided the variation is compensated for by a combined dry tensile strength test value in excess of the minimum requirement obtained from the tables in the ratio of 5 units of tearing strength for each unit of dry tensile strength below the minimum requirement.

§ 178.238-3 Construction.

(a) Bags must be at least 5 thicknesses of paper; this must be heavy duty shipping sack kraft paper, conforming to the requirements of § 78.238-2 paragraphs (a) and (b), or equivalent, with a minimum total basis weight of 320 pounds of paper (500 sheets, 24" x 36"). Outer sheet must be of water resistant stock and at least 70 pounds basis weight, inner sheets not less than 50 pounds basis weight. Bags to be of sewn, sift-proof bottom construction. Other bottoms of equal efficiency authorized.

NOTE 1: Exceptions to these construction requirements are authorized in §§ 173.367(a) (5) and 173.377 (1) of this chapter.

(b) Moistureproof barrier sheets of paper, if used, must meet the strength requirements of § 178.238-2(b) and shall be counted as 50 pounds basis weight (500 sheets, 24 x 36 inches).

§ 178.238-4 Adhesive.

(a) Moisture resistant adhesive must be used on all seams, joints, and bottom patch, if any.

§ 178.238-5 Closure.

(a) For all bags: Any closure for the top which is equal in efficiency to that of the bottom, is authorized.

§ 178.238-6 Tests for shipment.

(a) Bags as prepared for shipment must be able to withstand four 4-foot drops, one on each end and one each on opposite sides, without sifting or rupture.

§ 178.238-7 Marking.

(a) On each bag with letters and figures at least ½ inch high in rectangle as follows:

DOT-44D

(b) Each bag must also be marked with the name and address or symbol of the person making the mark specified in paragraph (a) of this section and be located just above or below that mark. Symbol, if used, must be registered with the Bureau of Explosives.

§ 178.239 Specification 44E; multiwall paper bags.

§ 178.239-1 Compliance.

(a) Required in all details.

§ 178.239-2 Paper.

(a) Shipping sack kraft paper, plain, or extensible plain, shall conform to the average requirements specified in paragraphs (a)(1) or (a)(2) of this section.

(1) Shipping sack, kraft paper, plain:¹

Nominal basis weight (500 sheets, 24" x 36") ^{2,4}	Minimum average dry tearing strength		Minimum average dry tensile strength per inch width	
	M.D. ³	Total M.D. plus C.D. ³	C.D. ³	Total C.D. plus M.D. ³
Pounds:	Grams	Grams	Pounds	Pounds
40.....	88	188	14	41
50.....	110	235	19	53
60.....	132	282	23	64
70.....	154	329	27	74

¹ Shipping sack kraft paper, plain, is paper that consists of all sulphate pulp and no other fiber, and which has not been treated by coloring, bleaching (except as provided by footnote 4 of this table), creping, coating, spraying, laminating, or impregnating for special qualities. Paper shall have a degree of water resistance as secured by normal rosin sizing and shall comply with the requirements in paragraph (a)(1) of this section.

² A tolerance of minus 10 percent of the basis weight of individual plies of plain shipping sack kraft paper will be permitted; an average tolerance of minus 5 percent will be permitted in the sum total basis weight of all plies in multiwall constructions. Variations in excess of specified basis weight will not be considered a defect or deviation. The basis weight of paper means the basis weight as produced by the paper machine, not including finish subsequently applied, such as coating or printing.

³ M.D. means machine direction. C.D. means cross direction.

⁴ A bleached sulphate kraft outer sheet of not less than 50 pounds basis weight is authorized providing the combined test values of all of the sheets of the bag are in conformance with paragraph (e) of this section and § 178.239-3.

(2) Shipping sack, extensible kraft paper plain.¹

Nominal basis weight (500 sheets, 24" x 36") ^{2,4}	Minimum dry tearing strength		Minimum tensile energy absorption ft./lbs. per square foot of paper ⁴	
	M.D. ³	Total M.D. plus C.D. ³	C.D. ³	Total C.D. plus M.D. ³
Pounds:	Grams	Grams		
40.....	88	188	4.5	14.0
50.....	110	235	5.6	17.0
60.....	132	282	7.0	20.0
70.....	154	329	8.0	23.0
80.....	176	376	9.0	26.0

¹ Extensible shipping sack kraft paper, plain, is paper that consists of all sulphate pulp and no other fiber, and which has not been treated by coloring, bleaching (except as provided by Footnote 4 of this table), creping, coating, spraying, laminating or impregnating for special qualities. Paper shall have a degree of water resistance as secured by normal rosin sizing, and shall comply with the requirements in paragraph (a)(2) of this section.

² A tolerance of minus 10 percent of the basis weight of individual plies of extensible shipping sack kraft paper will be permitted; an average tolerance of minus 5 percent will be permitted in the sum total basis weight of all plies in multiwall constructions. Variations in excess of specified basis weights will not be considered a defect or deviation. The basis weight of paper means the basis weight as produced by the paper machine, not including finish subsequently applied such as coating or printing.

³ M.D. means machine direction. C.D. means cross direction.

⁴ A bleached sulphate extensible kraft outer sheet of not less than 50 pounds basis weight is authorized providing the combined test values of all the sheets of the bag are in conformance with paragraph (e) of this section and § 178.239-3.

⁵ Variations in cross-direction tensile energy absorption of not more than 0.5 units below the minimum requirements will be permitted, provided the variations are compensated by an increase in the machine-direction tearing strength in the ratio of twenty units of tearing strength to one unit of tensile energy absorption, and variations in total tensile energy absorption of not more than one unit below the minimum requirements will be permitted, provided the variations are compensated by an increase in the total tearing strength in the same ratio. Similarly, variations in machine-direction tearing strength of not more than ten units below minimum requirements will be permitted, provided variations are compensated by an increase in cross-direction tensile energy absorption in the ratio of one unit of tensile energy absorption to twenty units of tearing strength; and variations in total tearing strength of not more than twenty units below the minimum requirements will be permitted, provided the variations are compensated by an increase in the total tensile energy absorption in the same ratio. Conformance with the requirements of Table shall be established by comparing the sum of the basis weights and tests for all of the plies specified in the construction of the bag, with the sum of the specified basis weights and tests for the respective papers comprising the different plies. All requirements in this table are for a paper conditioned to a relative humidity of 50 percent at a temperature of 23° C (73° F).

(b) Asphalt laminated or polyethylene coated shipping sack kraft paper when used shall comply with the following requirements:

Type paper	Minimum average dry tearing strength		Minimum average dry tensile strength per inch width		Heat resistance hours at 150° F. without impairing function of sack	Maximum average water-vapor permeability from both sides at 50 percent R.H. and 73° F. g/m. 2/24 hours	
	M.D.	Total M.D. plus C.D.	C.D.	Total C.D. plus M.D.		Un-creased	Creased ¹
	Grams	Grams	Pounds	Pounds			
Asphalt laminated ²	110	235	19	53	5	9.0	15.0
10PE-50 1/50-10PE ³	110	235	19	53	5	7.0	12.0
15PE-50 1/50-15PE ³	110	235	19	53	5	4.5	7.5

¹ Creasing at 40° F.

² Asphalt laminated kraft paper when used as a wall in fabricated sacks, shall conform to the requirements of paragraph (b) of this section and shall consist of two sheets of kraft paper, the total basis weight of the two paper plies not less than 50 pounds per ream (500 sheets, 24" x 36"), continuously and uniformly laminated together with an average of not less than 25 pounds of asphalt per ream (500 sheets, 24" x 36"). Tolerance of minus 5 percent will be allowed on individual components. The total basis weight of the finished combination shall not exceed 100 pounds per ream (500 sheets, 24" x 36"). An asphalt laminated kraft wall meeting these requirements may be substituted for a plain kraft wall of 50 pounds basis or less, provided it meets the specification.

³ Polyethylene-coated shipping sack kraft paper. The polyethylene-coated kraft paper when used as walls in fabricated sacks shall meet the heat resistance and water-vapor permeability requirements as specified in the table. A tolerance of minus 10 percent will be allowed for the lot sample average coating weight of polyethylene on shipping sack kraft paper. Minimum samples for testing shall comprise not less than 3 specimens 16 square inches each selected representatively from each polyethylene-coated wall of each sack in the lot sample. When barrier sheets are based on extensible kraft the weight of the barrier material shall be in addition to the basis weight of the paper.

⁴ Asphalt laminated extensible kraft paper must consist of two sheets of extensible kraft paper, the total basis weight of the paper in the finished combination being not less than 50 pounds per ream (24 x 36—500) with neither sheet weighing less than 23 pounds continuously and uniformly laminated together, with an average of not less than 25 pounds of asphalt per ream (24 x 36—500). In determining the basis weight and test conformance of bags containing an asphalt laminated extensible kraft wall, the asphalt laminated extensible kraft wall shall be treated as if it were a single extensible kraft wall or combination of walls of 10 pounds lower total paper basis weight than the sum of the nominal basis weight in the asphalt laminated wall, but in no case shall be treated as less than the equivalent of a 50 pounds basis weight wall.

(c) Laminating materials: Any laminant other than asphalt or other water-vapor barrier walls may be used provided they meet the requirements in paragraph (b) of this section.

(d) All values in paragraphs (a) and (b) of this section are for paper having a moisture content in equilibrium with an atmosphere having a relative humidity of 50 percent plus or minus 2 percent at a temperature of 73° F. plus or minus 3.5° F. following preconditioning of the test specimens to a moisture content between 3 and 5.5 percent by exposure to relatively dry air having a temperature no greater than 140° F.

(e) Conformance of sacks with paper strength requirements shall be established by comparing the sums of the test values for all the walls of the new and unused sack with the sums of the respective strength values specified in paragraphs (a) and (b) of this section for the respective papers specified for the different walls of the sack by a method acceptable to the Bureau of Explosives.

(1) Variation in cross direction dry tensile strength of not more than 2 units

below the minimum requirement based on paragraphs (a) and (b) of this section will be permitted for each wall of the sack, provided the variation is compensated for by a machine direction tearing strength test value in excess of the minimum requirement obtained from the tables, in the ratio of 5 units of tearing strength for each unit of dry tensile strength test below the minimum requirement; and variation in combined dry tensile strength of not more than 4 units below the minimum requirement based on paragraphs (a) and (b) of this section will be permitted for each wall used provided the variation is compensated for by a combined tearing strength test value in excess of the minimum requirement obtained from the tables in the ratio of 5 units of combined tearing strength for each unit of dry tensile strength test below the minimum requirement. Similarly, variation in machine direction tearing strength of not more than 10 units below the minimum requirement will be permitted for each wall, provided the variation is compensated for by a cross direction dry

tensile strength test value in excess of the minimum requirement obtained from the tables in the ratio of 1 unit of dry tensile strength for each 5 units of tearing strength test below the minimum requirement; and variation in combined tearing strength of not more than 20 units below the minimum requirement obtained from the tables will be permitted for each wall provided the variation is compensated for by a combined dry tensile strength test value in excess of the minimum requirement obtained from the tables in the ratio of 5 units of tearing strength for each unit of dry tensile strength below the minimum requirement.

§ 178.239-3 Construction and capacity.

(a) Bags must be at least 3 thicknesses of paper; this must be heavy duty shipping sack kraft paper conforming to the requirements of § 178.239-2 paragraphs (a) and (b), or equivalent, with a minimum total basis weight of 130 pounds of paper (500 sheets, 24" x 36"). Outer sheet must be of water-resistant stock and at least 50 pounds basis weight, inner sheet not less than 40 pounds basis weight. Bags to be of sewn and taped, cemented, taped, satchel bottom or other construction of equal efficiency to form a sift-proof and reasonably airtight container. Authorized for not over 50 pounds net weight, except that bags having a minimum total basis weight of 160 pounds of paper (500 sheets 24" x 36") with outer sheet of water-resistant stock and at least 60 pounds basis weight inner sheets not less than 50 pounds basis weight, are authorized for not to exceed 100 pounds net weight of contents.

(b) Moistureproof barrier sheets of paper, if used, must meet the requirements of § 178.239-2(b) and shall be considered as one thickness of paper and shall be counted as 50 pounds basis weight (500 sheets, 24" x 36").

§ 178.239-4 Adhesive.

(a) Moisture resistant adhesive must be used on all seams, joints, and bottom patch, if any.

§ 178.239-5 Closure.

(a) For all bags: Any closure for the top which is equal in efficiency to that of the bottom, is authorized.

§ 178.239-6 Tests for shipment.

(a) Bags as prepared for shipment must be able to withstand four 4-foot drops, one on each end and one each on opposite sides, without sitting or rupture.

§ 178.239-7 Marking.

(a) On each bag with letters and figures at least $\frac{1}{2}$ inch high in rectangle as follows:

DOT-44E

(b) Each bag must also be marked with the name and address or symbol of the person making the mark specified in paragraph (a) of this section and be located just above or below that mark. Symbol, if used, must be registered with the Bureau of Explosives.

§ 178.240 Specification 45B; bags, cloth and paper, lined.

§ 178.240-1 Compliance.

(a) Required in all details.

§ 178.240-2 Capacity.

(a) Not over 100 pounds net.

§ 178.240-3 Assembly.

(a) Bags shall consist of cloth and paper parts all cemented together with curing ruber latex or asphalt, thus making a waterproofed bag as follows:

- (1) Inside lining sheet.
- (2) Cloth sheet.
- (3) Intermediate sheet.
- (4) Outside paper sheet.

§ 178.240-4 Inside lining sheet and intermediate sheet.

(a) Inside lining sheet and intermediate sheet must be regenerated cellulose film at least 0.0012 inch thick or polyvinyl alcohol film at least 0.001 inch thick or other material of equal thickness and equivalent efficiency.

§ 178.240-5 Cloth sheet.

(a) Cloth sheet must be burlap at least 8-ounce, 40-inch Calcutta A or B mill grade or Osnaburg cotton cloth at least 8½ ounces per square yard.

§ 178.240-6 Paper.

(a) Paper must be shipping sack Kraft, creped, at least 45 pounds per

ream (500 sheets 24" x 36") before creping.

§ 178.240-7 Latex and asphalt.

(a) Later and asphalt must be in sufficient quantity to form a secure bond between the parts of the bags.

§ 178.240-8 Seams.

(a) Seams must be dust-tight and made by cementing or by sewing and taping with impregnated cloth tape to give seam strength at least equal to that of bag material and prevent sifting.

§ 178.240-9 Test.

(a) The finished container, filled and closed as for shipment, must be capable of withstanding 2 drop tests of 6 feet on the butt and 2 drop tests of 6 feet on the side without sifting or rupture of burlap or liner.

§ 178.240-10 Marking.

(a) Marking on each container by marks at least 1 inch high as follows:

- (1) DOT-45B.
- (2) Name and address or symbol of person making the mark specified in paragraph (a)(1) of this section and located just above or below that mark. Symbol, if used, must be registered with the Bureau of Explosives.

§ 178.240-11 Closing for shipment.

(a) By sewing and taping with impregnated cloth tape to give seam strength at least equal to that of bag material and prevent sifting.

§ 178.241 Specification 44P; all-plastic bags.

§ 178.241-1 Compliance.

(a) Required in all details.

§ 178.241-2 Plastic.

(a) Plastic film shall be low density polyethylene having a melt index of 0.6 maximum, conforming to the minimum requirements specified in subparagraph (a)(1) of this section.

(1) Plastic film:

Nominal gauge (mils) ¹	Drop dart (grams) ²	Pounds per square inch tensile ³	Percent elongation ³	Tear (grams) ⁴
5	210	2,100	350	200
6	250	2,100	350	240
7	295	2,100	350	280
8	340	2,100	350	350

¹ Gauge as measured by ASTM D 374-57T, tolerance ± 10 percent.

² Drop dart as measured by the drop dart method (ASTM D 1709-61T Method B). Under this method a polished steel dart having a diameter of 2 inches in the hemispherical head is suspended by an electro-magnet at a height sufficient to provide a drop of 60 inches to the surface of the test specimen. The test specimen must be placed over the bottom part of a 2-piece annual clamp having an inside diameter of 5 inches, so as to be uniformly flat and free of folds. Test specimen must cover the clamp at all points. Not less than 10 specimens, not more than one drop per specimen, must be tested. If one-half or more of the specimens tested resist failure the film shall be deemed to meet the requirements. Failure is defined as any break through the film.

³ Tensile and percent elongation as measured by ASTM D 882-61T Method A.

⁴ Tear as measured by ASTM D 1922-61T.

§ 178.241-3 Construction and capacity.

(a) Bags must be constructed of plastic film conforming to the requirements of § 178.241-2. Bags having heat-sealed ends must be capable of withstanding static loads of 1¼ pounds per mill per inch of seal as measured in the following manner. Three 1-inch wide samples must be cut from the top seal and 3 1-inch wide samples must be cut from the bottom seal of each bag to be tested. Samples must be cut perpendicular to the seal, one from the center of the seal and one each approximately 4 inches in each direction from the center of the seal. (The preferred method of cutting the samples is to place a 1-inch wide die on the flat bag so that both film layers and the seal area can be cut simultaneously). Samples must be cut of sufficient length to permit wrapping each film end around a ¼-inch diameter metal rod and to permit clamping each end 1 inch from heat seal. Clamp used (such as a laboratory tubing clamp) must be one that will exert even pressure across a 1-inch wide strip. Clamps must be carefully positioned on strips parallel to the heat seals. One clamp must be mounted to a support, permitting the sample strip to hang vertically, and a weight must be attached to the other clamp hanging free at the

lower end of the assembly. The total weight exerted on the seal must be $1\frac{1}{4}$ pounds for each mil of gauge of the film. The test must be conducted at room temperature (approximately 73° F.). All samples tested must resist failure. Failure is defined as total seal separation occurring within 10 minutes after the test has begun. Other end closures of equal efficiency authorized. Bags of not less than 5-mil construction authorized for contents not to exceed 51 pounds net weight. Bags of not less than 7-mil construction authorized for contents not to exceed 81 pounds net weight.

§ 178.241-4 Tests for shipment.

(a) Bags as prepared for shipment must be able to withstand six drops from a height of 4 feet onto a solid surface, one drop on each end, one drop on each face, and one drop on each side (edge), without sifting or rupture.

§ 178.241-5 Marking.

(a) Each bag must be marked with letters and figures at least $\frac{1}{2}$ inch high in rectangle as follows:

(1) DOT-44P.

(2) This marking shall be enclosed by a rectangle.

(b) Each bag must also be marked with the name and address or symbol of the person making the mark specified in paragraph (a) of this section and be located just above or below that mark. Symbol, if used, must be registered with the Bureau of Explosives.

Subpart H—Specifications for Portable Tanks

§ 178.245 Specification 51: steel portable tanks.

§ 178.245-1 Requirements for design and construction.

(a) Tanks must be of seamless or welded steel construction or combination of both and must have in excess of 1,000 pounds water capacity. Fusion welded tanks must be postweld heat treated and radiographed to provide the highest joint efficiency provided by the

ASME Code. Tanks must be designed and constructed in accordance with and fulfill the requirements of the ASME Code. Tanks constructed in accordance with the requirements of Part UHT of the ASME Code must comply with the following additional requirements:

(1) Welding procedure and welder performance tests must be made annually in accordance with section IX of the ASME Code. In addition to the essential variables named therein the following must be considered to be essential variables: Number of passes, thickness of plate, heat input per pass, and manufacturer's identification of rod and flux. The number of passes, thickness of plate and heat input per pass may not vary more than 25 percent from the procedure qualification. Records of the qualification must be retained for at least 5 years by the tank manufacturer and made available to duly identified representatives of the Department or the owner of the tank.

(2) Impact tests must be made on a lot basis. A lot is defined as 100 tons or less of the same heat and having a thickness variation no greater than plus or minus 25 percent. The minimum impact required for full-sized specimens shall be 20 foot-pounds (or 10 foot-pounds for half-sized specimens) at 0° F. Charpy V-Notch in both the longitudinal and transverse direction. If the lot test does not pass this requirement, individual plates may be accepted if they individually meet this impact requirement.

(b) Except as noted below, all openings in the tank shall be grouped in one location, either at the top of the tank or at one end of the tank.

Exceptions: (1) The openings for liquid level gauging devices, or for safety devices, may be installed separately at the other location or in the side of the shell; (2) one plugged opening of 2-inch National Pipe Thread or less provided for maintenance purposes may be located elsewhere; (3) an opening of 3-inch National Pipe Size or less may be provided at another location, when necessary, to facilitate installation of condensing coils.

(c) Each uninsulated tank used for the transportation of compressed gas, as defined in § 173.300 of this subchapter, must have an exterior surface finish that

is significantly reflective such as a light reflecting color if painted, or a bright reflective metal or other material if unpainted.

§ 178.245-2 Material.

(a) All material used for the construction of the tank and appurtenances shall be suitable for use with the commodity to be transported therein.

(b) A material of thickness less than $\frac{3}{16}$ inch shall not be used for the shells and heads.

§ 178.245-3 Design pressure.

(a) The design pressure of a tank authorized under this specification shall be not less than the vapor pressure of the commodity contained therein at 115° F., or as prescribed for a particular commodity by Part 173 of this chapter, except that in no case shall the design pressure of any container be less than 100 psig nor more than 500 psig. When corrosion factor is prescribed by these regulations, the wall thickness of the tank calculated in accordance with the "Code" (see § 178.245-1(a)) shall be increased by 20 percent or 0.10 inch, whichever is less.

NOTE 1: The term "design pressure" as used in this specification is identical to the term "maximum allowable working pressure" as used in the "Code" (see § 178.245-1(a)).

§ 178.245-4 Tank mountings.

(a) Tanks shall be designed and fabricated with mountings to provide a secure base in transit. "Skids" or similar devices shall be deemed to comply with this requirement.

(b) All tank mountings such as skids, fastenings, brackets, cradles, lifting lugs, etc., intended to carry loadings shall be permanently secured to tanks in accordance with the requirements of the Code under which the tanks were fabricated and shall be designed to withstand static loadings in any direction equal to twice the weight of the tank and attachments when filled with the lading using a safety factor of not less than four, based on the ultimate strength of the material to be used. The specific gravity used in determining the static loadings shall be shown on the marking required by § 178.245-6(a) and

on the report required by § 178.245-7(a).

(c) Lifting lugs or hold-down lugs may be added to either the tank or tank mountings. If lifting lugs and hold-down lugs are added directly to the tank, they shall be secured to doubling plates welded to the tank and located at points of support, except that lifting lugs or hold-down lugs with integral bases serving as doubling plates may be welded directly to the tank. Each lifting lug and hold-down lug shall be designed to withstand static loadings in any direction equal to twice the weight of the tank and attachments when filled with the lading using a safety factor of not less than four, based on the ultimate strength of the material to be used.

(d) All tank mountings shall be designed so as to prevent the concentration of excessive loads on the tank shell.

§ 178.245-5 Protection of valves and accessories.

(a) All valves, fittings, accessories, safety devices, gaging devices, and the like shall be adequately protected against mechanical damage.

(b) The protective device or housing shall comply with the requirements under which the tanks are fabricated with respect to design and construction, and shall be designed to withstand static loadings in any direction equal to twice the weight of the tank and attachments when filled with the lading using a safety factor of not less than four, based on the ultimate strength of the material to be used.

(c) Requirements concerning types of valves, retesting, and qualification of portable tanks contained in §§ 173.32 and 173.315 of this chapter must be observed.

§ 178.245-6 Name plate.

(a) In addition to the markings required by the Code (see § 178.245-1(a)) under which tanks were constructed, they shall have permanently affixed, on one of the heads of the tank, a metal plate. This plate shall be permanently affixed by means of soldering, brazing, or welding around its complete perimeter. Neither the plate itself nor the means of attachment to the tank shall be subject to destructive attack by the contents of tank. Upon such plate shall be plainly marked by stamping, embossing, or other means of forming, letters into or onto the metal of the plate

itself the following information in characters at least $\frac{3}{8}$ inch high:

Manufacturer's name _____
 Serial No. _____ Owner's serial No. _____
 D.O.T. Specification No. _____
 Water capacity (pounds) _____
 Tare weight (pounds) _____
 Design pressure (psig) _____
 Design specific gravity _____
 Original test date _____
 Tank retested at _____ (psig) on _____

(b) All tank outlets and inlets, except safety relief valves, shall be marked to designate whether they communicate with vapor or liquid when the tank is filled to the maximum permitted filling density.

§ 178.245-7 Report.

(a) A copy of the manufacturer's data report required by the Code (see § 178.245-1(a)) under which the tank is fabricated shall be furnished for each new tank to the owner.

(b) The rated gross weight of the tank must not exceed the values used during the design qualification vibration and drop tests.

(c) Each tank must be in compliance with all applicable requirements of §§ 173.24 and 173.32 of this chapter.

§ 178.251-2 Materials of construction.

(a) Except for gaskets, pressure relief devices, valve seats, liners, and linings, all construction material must be metal.

(b) Hardware for handling and securing, fitting protection, outlet piping, valves, relief devices, and closures must be made of material that is electrolytically compatible with, or suitably protected from electrolytic action when joined to the product retention components of the tank.

(c) Any material used must not be susceptible to stress corrosion cracking.

(d) Material specification: All sheet, plate, and extruded material for shell, heads, bulkheads, and baffles for portable tanks must meet the following minimum requirements:

(1) *Aluminum alloys.* Aluminum alloys must be suitable for fusion welding and must meet the following requirements:

Minimum yield strength..... 24,000 p.s.i.
 Minimum ultimate strength..... 30,000 p.s.i.
 Minimum elongation of standard 2 inch gage length..... 8 percent

(2) *Steel.* Steel must meet the following requirements:

	Mild steel	Low alloy low carbon	Stainless
Minimum yield strength, p.s.i.	25,000	45,000	25,000
Minimum ultimate strength, p.s.i.	45,000	60,000	70,000
Minimum elongation of standard 2 inch gage length (percent)	20	25	30

(3) *Magnesium alloys.* Magnesium alloy must conform to ASTM B-90-69, Grade ZE-10A.

§ 178.251 General design and construction requirements applicable to specifications 56 (§ 178.252) and 57 portable tanks (§ 178.253).

§ 178.251-1 General requirements.

(a) These specifications apply to tanks of any shape (cylindrical, conical, cubical, or other).

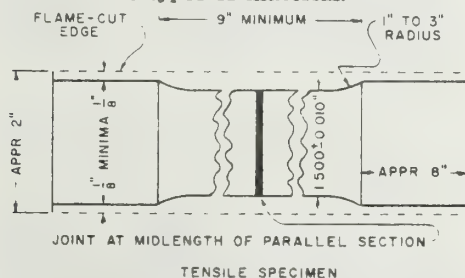
§ 178.251-3 General construction requirements.

(a) *Method of joining.* All joints between tank shells, heads, baffles (or baffle attaching rings), and bulkheads must be welded in accordance with the requirements of this section.

(b) *Strength of joints (Aluminum Alloy (AL), Magnesium Alloy (MG))*. All welded joints must be made in accordance with recognized good practice. The efficiency of a joint must not be less than 85 percent of the mechanical properties of the adjacent material. Each alloy must be joined by an inert gas arc welding process using filler metals which are consistent with material suppliers recommendations.

(c) *Strength of joints (Mild Steel (MS), High Strength Low Alloy (HSLA), Austenitic Stainless Steel (SS))*. Joints must be welded in accordance with recognized good practice. The efficiency of any joint must not be less than 85 percent of the mechanical properties of the adjacent material.

(d) *Compliance test*. Compliance with the requirements contained in paragraph (b) or (c) of this section for the welded joints must be determined by preparing two test specimens from materials representative of those to be used in each tank. Joints must be made by the same technique of fabrication and must conform to the figure below. Each specimen must be tested to failure under tension. One pair of test specimens may represent all the tanks to be made of the same combination of materials by the same technique of fabrication, and in the same shop, within 6 months after the tests on such samples have been completed. The butt welded specimens tested may be considered as qualifying other types or combinations of types of weld using the same filler material and welding process as long as parent metals are of the same types of material.



§ 178.251-4 Stacking, mounting, and tie-down provisions.

(a) *Load support devices*. Each tank designed to be stacked in storage must be provided with load support devices. There may be no significant permanent deformation of the load support devices or the tank under either of the following stress conditions:

(1) Tanks loaded to their maximum authorized gross weight and stacked at least 18 feet high.

(2) A load on the support devices at least three times the maximum authorized gross weight of the tank.

(b) *Base mounting*. Each tank must be constructed with mountings to provide a secure base during transportation. The mounting may be in the form of a skid or similar structure.

(c) *Tie-down system*. If there are tie-down devices that are a structural part of the tank, the tie-down system must be capable of withstanding the following static loading without significant deformation to the tank. The static loading applied must have, with respect to the center of gravity of the tank a vertical component of at least two times the maximum authorized gross weight of the tank.

(1) If the design of the tank necessitates specific front and side orientation when loaded on a transportation vehicle, the static loading applied must have two horizontal components at right angles to each other, one direction at a time as follows:

(i) A longitudinal component at least seven times the maximum authorized gross weight of the tank in the direction of travel of the vehicle, and

(ii) A component of five times the maximum authorized gross weight of the tank in the transverse direction, or

(2) If the design of the tank does not necessitate specific front and side orientation when loaded on a transportation vehicle, the static loading applied must have two horizontal components at right angles to each other, one direction at a time, of at least seven times the maximum authorized gross weight of the tank.

(d) If there is a structural part of the tank that could be used to tie the tank down and which is not in compliance with paragraph (c) of this section, it must be securely covered or locked during transportation to prevent its use as a tie-down.

§ 178.251-5 Testing.

(a) *Design qualification testing*. Design qualification tests prescribed in this paragraph must be made on at least one of each design and size tank, except that a set of tests, when made on a tank of one size, may serve to qualify smaller

tanks made of same kind and thickness of materials, by the same fabrication technique, and with identical supports, and equivalent closures, and other appurtenances. Tests must be performed sequentially on a single tank in the order listed in this section. Additional tests must be made if there is any increase in design size of the tank, any reduction in thickness of material, or any change in material, or in fabrication technique. Test samples must be retained for 1 year.

(1) *Vibration and drop tests.* See applicable specification, § 178.252-3(a) or § 178.253-5(a).

(2) *Structural integrity tests—(i) Lifting devices.* If there is a system of lifting devices that is a structural part of the tank or is permanently attached thereto or to the support structure, the system must be capable of supporting at least three times the maximum gross weight of the tank, and each individual lifting device must be capable of supporting at least the maximum gross weight of the tank, without significant permanent deformation in either the lifting device system or in any part of the tank.

(ii) *Shipment support structure.* If the tank supports are a structural part of the tank, the supports must be capable of absorbing a force equal to the maximum gross weight of the tank or breaking without significant permanent deformation to the product retention component of the tank. The force must be applied to the supports at ground level from at least two horizontal directions at right angles to each other, one direction at a time.

(iii) *Stacking support devices.* If stacking support devices are a structural part of the tank, there must be no significant permanent deformation of any device or the tank under either of the following stress conditions:

(a) Tanks loaded to their maximum authorized gross weight and stacked at least 18 feet high.

(b) A load on the stacking support devices of at least three times the maximum authorized gross weight of the tank.

(iv) *Fittings and protective devices.* Each fitting (or its protective device) subject to this test requirement must be capable of withstanding a force at least two times the maximum authorized gross weight of the tank without resultant damage to the fitting. The force must be applied to the fitting or its protective device in at least two horizontal directions at right angles to each other, one

direction at a time, and in alignment with the fitting.

(b) *Production quality control, testing and inspection.* See applicable specification, § 178.252-3(b) or § 178.253-5(b).

§ 178.251-6 Rejected tanks.

No tank which fails to pass any of the prescribed tests may be placed in service until suitable repairs have been made and satisfactory re-tests results have been obtained.

§ 178.251-7 Identification and marking.

(a) A metal certification plate must be permanently affixed to each tank and must be readily accessible for inspection. The plate must be marked in letters and numerals at least $\frac{3}{8}$ -inch high by stamping, embossing, or other means of forming letters into or on the metal plate itself. The marking must contain at least the following information:

Tank manufacturer	
Specification identification: Spec. 56 or Spec. 57	
Design pressure (for specification 57 only)	p.s.i.g.
Test pressure (for specification 56 only)	p.s.i.g.
Serial number	
Original test date	
Tare weight	lbs.
Rated gross weight ¹	lbs.
Volumetric capacity	U.S. gal. (or cu. ft.)
Materials of construction ²	

¹ The rated (permitted) gross weight may not exceed that weight used during the design qualification tests involving vibration and drop.

² E.g., AL for aluminum, MG for magnesium alloy, MS for mild steel, HSLA for high strength low alloy, SS for austenitic stainless steel, including ASTM or ASME reference.

(b) Unless the tank has been designed for stacking and meets the appropriate stacking integrity requirements of this specification, it must also be marked in letters at least 2 inches high in contrasting colors "Do Not Stack" and "Do Not Place Other Freight On Top Of This Tank", on at least two sides of the tank. These instructions must also appear on the certification plate. Plate markings are required to meet the requirements of paragraph (a) of this section and need not be in contrasting color.

§ 178.252 Specification 56; metal portable tank.

§ 178.252-1 General requirements.

(a) Each tank must be in compliance with the general design and construction requirements in § 178.251 in addition to the specific requirements of this section.

(b) Each tank may not exceed a rated gross weight of 7,000 pounds.

§ 178.252-2 Openings.

(a) Each fill and discharge opening must be equipped with a closure and locking device.

(b) A drum-type locking ring closure is authorized for openings not exceeding 23 inches in diameter. A drum-type locking ring closure must be at least a 12-gage bolted ring with forged lugs having at least a $\frac{5}{8}$ -inch steel bolt tapped into one of the lugs. The locking ring must be equipped with a lock nut or equivalent device.

(c) For a tank that incorporates a hopper-type product discharge opening, the closure device must be constructed to retain product under the test conditions outlined in §§ 178.251-5 and 178.252-3(a). Closures for those openings must be designed with positive mechanical locking and sealing devices to prevent leakage during normal conditions incident to transportation.

§ 178.252-3 Testing.

(a) *Design qualification testing.* In addition to the testing prescribed in § 178.251-5(a), a vibration and a drop test are also required on each design. For these tests, the tank must be filled with a fine, dry powdered material having a density that results in the tank having a gross weight not less than the rated gross weight of the tank.

(1) *Vibration test.* This test must be performed for 1 hour using a minimum double amplitude of 1 inch at a frequency that causes the test tank to be raised from the floor of the testing table so a piece of flat steel strap may be passed between the tank and the table. The tank must be restrained so that all horizontal motion is restricted and only vertical motion is permitted.

(2) *Drop test.* The tank must be capable of withstanding without leakage of contents a 2-foot free drop onto a flat unyielding horizontal surface, striking the target surface in the position and at-

titude from which maximum damage to the tank (including closures) is expected.

(b) *Production quality control, testing, and inspection.*—(1) *Leakage test.* Each tank must be tested by a minimum air or hydrostatic pressure of at least 2 pounds per square inch gage applied to the entire tank. If the air pressure is used, the entire surface of all joints under pressure must be coated with, or immersed in, a solution of soap and water, or other material suitable for the purpose of detecting leaks. If the hydrostatic pressure test is used it must be carried out by using water or other liquid having a similar viscosity, the temperature of which may not exceed 100° F. and all joints under pressure must be inspected for leaks. For either test, the pressure must be held for a period of time sufficiently long to assure detection of leaks. All closures must be in place during the test. Any tank that has detectable leakage or significant permanent deformation does not meet the requirements of this specification.

§ 178.253 Specification 57; metal portable tank.

§ 178.253-1 General requirements.

(a) Each tank must be in compliance with the general design and construction requirements in § 178.251 in addition to the specific requirements of this section.

(b) Each tank must have a capacity of at least 110 gallons but not more than 660 gallons.

§ 178.253-2 Openings.

(a) Each fill and discharge opening must be equipped with a closure device that meets the following requirements:

(1) Any closure for a fill opening in excess of 20 square inches must be equipped with a device to prevent the closure from fully opening without first relieving internal pressure.

(2) Any product discharge valve, if used, must be provided with a leak tight device, such as a cap or plug.

(3) Each closure must be vapor tight.

(b) A drum-type locking ring closure is authorized for any opening less than 23 inches in diameter. A drum-type locking ring closure must be at least a 12-gage bolted ring with forged lugs having at least a $\frac{5}{8}$ -inch steel bolt tapped into one of the lugs. The locking ring must be

equipped with a lock nut or equivalent device.

§ 178.253-3 Protection of fittings.

Each fitting which could be damaged sufficiently to result in leakage of tank contents must be protected by suitable guards or protective housings. The term "fitting" includes valves, closure devices, safety relief devices, and other accessories through which contents could leak from the tank. Each fitting or fitting protection device must be capable of withstanding the fitting protection test specified in § 178.251-5.

§ 178.253-4 Vents.

(a) Each tank must be equipped with at least one pressure relief device such as a spring-loaded valve, frangible disc or fusible plug.

(b) Each pressure relief device must communicate with the vapor space of the tank when the tank is in a normal transportation attitude. Shutoff valves must not be installed between the tank opening and any pressure relief device. Pressure relief devices must be mounted, shielded, or drained to prevent the accumulation of any material that could impair the operation or discharge capability of the device.

(c) The total emergency venting capacity (cu. ft./hr.) of each portable tank must be at least that determined from the following table.

Total surface area square feet ¹ :	Cubic feet free air per hour
20	15,800
50	23,700
40	31,600
50	39,500
60	47,400
70	55,300
80	63,300
90	71,200
100	79,100
120	94,900
140	110,700
160	126,500

¹ Interpolate for intermediate sizes.

² Surface area excludes area of legs.

(1) The pressure operated relief device must open at not less than 3 pounds per square inch gage and at not over the design test pressure of the tank. The minimum venting capacity for pressure activated vents must be 6,000 cubic feet of free air per hour (measured at 14.7

p.s.i.a. and 60° F.) at not more than 5 pounds per square inch gage.

(2) If a frangible device is used for relieving pressure, the device must have a minimum area of 1.25 square inches and must be rated at less than the design test pressure of the tank.

(3) If a fusible device is used for relieving pressure, the device must have a minimum area of 1.25 square inches. The device must function at a temperature between 220° F. and 300° F. and at a pressure less than the design test pressure of the tank, unless this latter function is accomplished by a separate device.

(d) No relief device may be used which would release flammable vapors under normal conditions of transportation (temperature up to and including 130° F.).

§ 178.253-5 Testing.

(a) *Design qualification testing.* In addition to the testing prescribed in § 178.251-5, a vibration test, a drop test, and a pressure test are also required on each design. For the vibration and drop tests, the tank must be filled with a liquid to not less than the rated gross weight.

(1) *Vibration test.* This test must be performed for 1 hour using a minimum double amplitude of 1 inch at a frequency that causes the test tank to be raised from the floor of the testing table so a piece of flat steel strap may be passed between the tank and the table. The tank must be restrained so that all horizontal motion is restricted and only vertical motion is permitted.

(2) *Drop test.* The tank must be capable of withstanding without leakage of contents a 2-foot free drop onto a flat unyielding horizontal surface, striking the target surface in the position and attitude from which maximum damage to the tank (including piping and fittings) is expected.

(3) *Pressure test.* The tank must be capable of maintaining, under hydrostatic test for at least 5 minutes, at least one and one-half times the design pressure prescribed in this paragraph, without detectable leakage or significant permanent deformation. The pressure must be measured at the top of the tank. Each closure must be in place and blocked if necessary as for shipment. Each closure must be standard, except that tapping for pressurizing and gaging is permitted.

Design pressure must be determined as follows:

$$P = \frac{hd}{115} + 3$$

Where:

P=Design pressure in p.s.i.g.;

h=Inside height of tank in inches;

d=Maximum allowable density in pounds per gallon;

115=Number of cubic inches in 1 gallon (231) divided by a safety factor of two.

(b) *Production quality control, testing and inspection*—(1) *Leakage test*. Each tank must be leak tested by a minimum sustained air pressure of at least three pounds per square inch gage applied to the entire tank. The entire surface of all joints under pressure must be coated with or immersed in a solution of soap and water or other material suitable for the purpose of detecting leaks. The pressure must be held for a period of time sufficiently long to assure detection of leaks. All closures must be in place during the test, but safety relief devices may be removed and such openings plugged. Any tank that has detectable leakage or significant permanent deformation does not meet the requirements of this specification.

§ 178.255 Specification 60; steel portable tanks.

§ 178.255-1 General requirements.

(a) Tanks must be of fusion welded construction, cylindrical in shape with seamless heads concave to the pressure. Tank shells may be of seamless construction.

(b) Tanks must be designed and constructed in accordance with and fulfill all the requirements of the ASME Code.

(c) Tanks including all permanent attachments must be postweld heat treated as a unit.

(d) Requirements concerning types of valves, retesting, and qualification of portable tanks contained in §§ 173.32 and 173.315 of this chapter must be observed.

§ 178.255-2 Material.

(a) Material used in the tank must be steel of good weldable quality and conform with the requirements of the ASME Code.

(b) The minimum thickness of metal, exclusive of lining material, for shell and heads of tanks shall be as follows:

Tank capacity:	Minimum thickness (inch)
Not more than 1,200 gallons-----	$\frac{1}{4}$
Over 1,200 to 1,800 gallons-----	$\frac{5}{16}$
Over 1,800 gallons-----	$\frac{3}{8}$

§ 178.255-3 Expansion domes.

(a) Expansion domes, if applied, must have a minimum capacity of one percent of the combined capacity of the tank and dome.

§ 178.255-4 Closures for manholes and domes.

(a) The manhole cover shall be designed to provide a secure closure of the manhole. All covers, not hinged to the tanks, shall be attached to the outside of the dome by at least $\frac{1}{8}$ inch chain or its equivalent. Closures shall be made tight against leakage of vapor and liquid by use of gaskets of suitable material.

§ 178.255-5 Bottom discharge outlets.

(a) Bottom discharge outlets prohibited, except on tanks used for shipments of sludge acid and alkaline corrosive liquids

(b) If installed, bottom outlets or bottom washout chambers shall be of metal not subject to rapid deterioration by the lading, and each shall be provided with a valve or plug at its upper end and liquid-tight closure at its lower end. Every such valve or plug shall be designed to insure against unseating due to stresses or shocks incident to transportation. Bottom outlets shall be adequately protected against handling damage and outlet equipment must not extend to within less than one inch of the bottom bearing surface of the skids or tank mounting.

§ 178.255-6 Loading and unloading accessories.

(a) When installed, gauging, loading and air inlet devices, including their valves, shall be provided with adequate means for their secure closure; and means shall also be provided for the closing of pipe connections of valves.

(b) Interior heater coils, if installed, must be of extra heavy pipe and so constructed that breaking off of exterior connections will not cause leakage of tanks.

§ 178.255-7 Protection of valves and accessories.

(a) All valves, fittings, accessories, safety devices, gauging devices, and the like shall be adequately protected against mechanical damage by a housing closed with a cover plate.

(b) Protective housing shall comply with the requirements under which the tanks are fabricated with respect to design and construction, and shall be designed with a minimum factor of safety of four to withstand loadings in any direction equal to two times the weight of the tank and attachments when filled with water.

§ 178.255-8 Safety devices.

(a) Safety devices are to be as required, subject to approval of the Bureau of Explosives, by shipping regulations.

§ 178.255-9 Compartments.

(a) When the interior of the tank is divided into compartments, each compartment shall be designed, constructed and tested as a separate tank. Thickness of shell and compartment heads shall be determined on the basis of total tank capacity.

§ 178.255-10 Lining.

(a) If a lining is required, the material used for lining the tank shall be homogeneous, nonporous, imperforate when applied, not less elastic than the metal of the tank proper. It shall be of substantially uniform thickness, not less than $\frac{1}{32}$ inch thick if metallic, and not less than $\frac{1}{16}$ inch thick if nonmetallic, and shall be directly bonded or attached by other equally satisfactory means. Rubber lining shall be not less than $\frac{3}{16}$ inch thick. Joints and seams in the lining shall be made by fusing the material together or by other equally satisfactory means. The interior of the tank shall be free from scale, oxidation, moisture and all foreign matter during the lining operation.

§ 178.255-11 Tank mountings.

(a) Tanks shall be designed and fabricated with mountings to provide a secure base in transit. "Skids" or similar devices shall be deemed to comply with this requirement.

(b) All tank mountings such as skids, fastenings, brackets, cradles, lifting lugs, etc., intended to carry loadings shall be permanently secured to tanks in accordance with the requirements under which

the tanks are fabricated, and shall be designed with a factor of safety of four, and built to withstand loadings in any direction equal to two times the weight of the tanks and attachments when filled to the maximum permissible loaded weight.

(c) Lifting lugs or side hold-down lugs shall be provided on the tank mountings in a manner suitable for attaching lifting gear and hold-down devices. Lifting lugs and hold-down lugs welded directly to the tank shall be of the pad-eye type. Doubling plates welded to the tank and located at the points of support shall be deemed to comply with this requirement.

(d) All tank mountings shall be so designed as to prevent the concentration of excessive loads on the tank shell.

§ 178.255-12 Pressure test.

(a) Each completed portable tank prior to application of lining shall be tested before being put into transportation service by completely filling the tank with water or other liquid having a similar viscosity, the temperature of which shall not exceed 100° F. during the test, and applying a pressure of 60 pounds per square inch gauge. The tank shall be capable of holding the prescribed pressure for at least 10 minutes without leakage, evidence of impending failure, or failure. All closures shall be in place while the test is made and the pressure shall be gauged at the top of the tank. Safety devices and/or vents shall be plugged during this test.

§ 178.255-13 Repair of tanks.

(a) Tanks failing to meet the test may be repaired and retested, provided that repairs are made in complete compliance with the requirements of this specification.

§ 178.255-14 Marking.

(a) In addition to marking required by the American Society of Mechanical Engineers Code, every tank shall bear permanent marks at least $\frac{3}{8}$ inch high stamped into the metal near the center of one of the tank heads or stamped into a plate permanently attached to the tank by means of brazing or welding or other suitable means as follows:

Manufacturer's name Serial No.
 DOT specification
 Nominal capacity (gallons)
 Tare weight (pounds)
 Date of manufacture

§ 178.255-15 Report.

(a) A copy of the manufacturer's data report required by the "Code" (see § 178.255-1(a)) under which the tank is fabricated shall be furnished for each new tank to the owner and the Bureau of Explosives. In addition, the manufacturer or owner shall register each tank with the Bureau of Explosives in the following form:

Place _____
Date _____

Portable tank

Manufactured for _____ Company
Location _____
Manufactured by _____ Company
Location _____
Consigned to _____ Company
Location _____
Size _____ feet outside diameter by _____
long.

Marks on tank as prescribed by § 178.255-14 of this specification are as follows:

Manufacturer's name _____
Serial number _____
Owner's serial number _____
DOT specification _____
ASME Code Symbol (par U-201) _____
Date of manufacture _____
Nominal capacity _____ Gallons

It is hereby certified that this tank is in complete compliance with the requirements of DOT specification No. 60.

(Signed) _____
Manufacturer or owner

Subpart I—[Reserved]

Subpart J—Specifications for Containers for Motor Vehicle Transportation

§ 178.315 Specification MC 200; containers for liquid nitroglycerin, desensitized liquid nitroglycerin or diethylene glycol dinitrate.

§ 178.315-1 Motor vehicle body.

(a) Every motor vehicle used for the transportation of liquid nitroglycerin, desensitized liquid nitroglycerin or diethylene glycol dinitrate, other than desensitized liquid explosives, as defined in § 173.53(e) of this chapter, shall have a body constructed as set forth below, which body shall have component parts as specified hereinafter.

§ 178.315-2 Body proper.

(a) The motor-vehicle body proper shall have a hinged cover. Both the body and the cover shall be well and

strongly built of wood or other non-sparking material of equal strength, thoroughly waterproofed, having no end or side openings, and lined with copper or other nonsparking sheet metal having all seams made tight against leakage of nitroglycerin, desensitized liquid nitroglycerin or diethylene glycol dinitrate by welding, brazing, or soldering. No metal of such character as to be capable of producing a spark when struck may be exposed on the inside or the top of the body, nor on the nether side or any edge of the cover, the top of which shall be covered with metal. The body shall be of such dimensions that it will contain only a single tier of individual containers and of such approximate height that the felt pads will securely constrain all inside containers from vertical motion with respect to the body, and shall be securely and firmly attached to the chassis of the motor vehicle. The total load shall not exceed nine hundred (900) quarts liquid measure of liquid nitroglycerin, desensitized liquid nitroglycerin or diethylene glycol dinitrate.

§ 178.315-3 Cellular construction.

(a) In the motor-vehicle body specified in § 178.315-2 shall be inserted suitable wooden or other nonmetallic, nonsparking cellular construction, the dimensions of each cell of which shall be such that the rubber "boot" or secondary container for the primary container of the nitroglycerin, desensitized liquid nitroglycerin or diethylene glycol dinitrate, both of which are specified hereinafter, shall snugly fit. The cellular construction shall extend from near the top to near the bottom of the full height of each "boot" to be fitted therein, and shall rest upon and be covered by at least one-half ($\frac{1}{2}$) inch of felt padding or other material affording equivalent shock-absorbing protection. The cellular construction shall be of such strength as to provide suitable restraint under all conditions of loading to prevent relative motion of inside containers to be inserted or carried therein.

§ 178.315-4 Inside containers and boots.

(a) *Inside containers.* Individual containers shall be made of copper or other nonsparking metal of equivalent strength, with all seams closed by weld-

ing, brazing or soldering, and shall be tight against leakage of liquid nitroglycerin, desensitized liquid nitroglycerin or diethylene glycol dinitrate. No individual container shall exceed ten (10) quarts (liquid measure) capacity of liquid nitroglycerin, desensitized liquid nitroglycerin or diethylene glycol dinitrate.

(b) *Boots, rubber containers for individual containers.* Each individual container of liquid nitroglycerin desensitized liquid nitroglycerin or diethylene glycol dinitrate shall be contained in a rubber boot or outer container into which it shall snugly fit, and which, in turn, shall snugly fit into any cell of the cellular construction specified in § 178.315-3. This boot shall be watertight throughout and at least of such volume as to contain all of the liquid content of liquid nitroglycerin, desensitized liquid nitroglycerin or diethylene glycol dinitrate of any inside container inserted in it. It shall be provided with V-shaped grooves at suitable spacings throughout its inside surface, extending from top to bottom in such manner as to prevent the entrapment of air therein upon insertion of the inside container of liquid nitroglycerin, desensitized liquid nitroglycerin or diethylene glycol dinitrate. The inside height of the rubber boot shall approximate the height of the inside container (including stopper) as shipped.

§ 178.315-5 Marking.

Each container must be marked as prescribed in § 173.24 of this subchapter.

§ 178.318 Specification MC 201: container for blasting caps, electric blasting caps and percussion caps.

§ 178.318-1 Scope.

(a) This specification pertains to a container to be used for the transportation of blasting caps, electric blasting caps, and percussion caps in connection with the transportation of liquid nitroglycerin desensitized liquid nitroglycerin or diethylene glycol dinitrate, where any or all of such types of caps may be used for the detonation of liquid nitroglycerin, desensitized liquid nitroglycerin or diethylene glycol dinitrate in blasting operations. This specification is not intended to take the place of any shipping or packing requirements of this Department where the caps in

question are themselves articles of commerce.

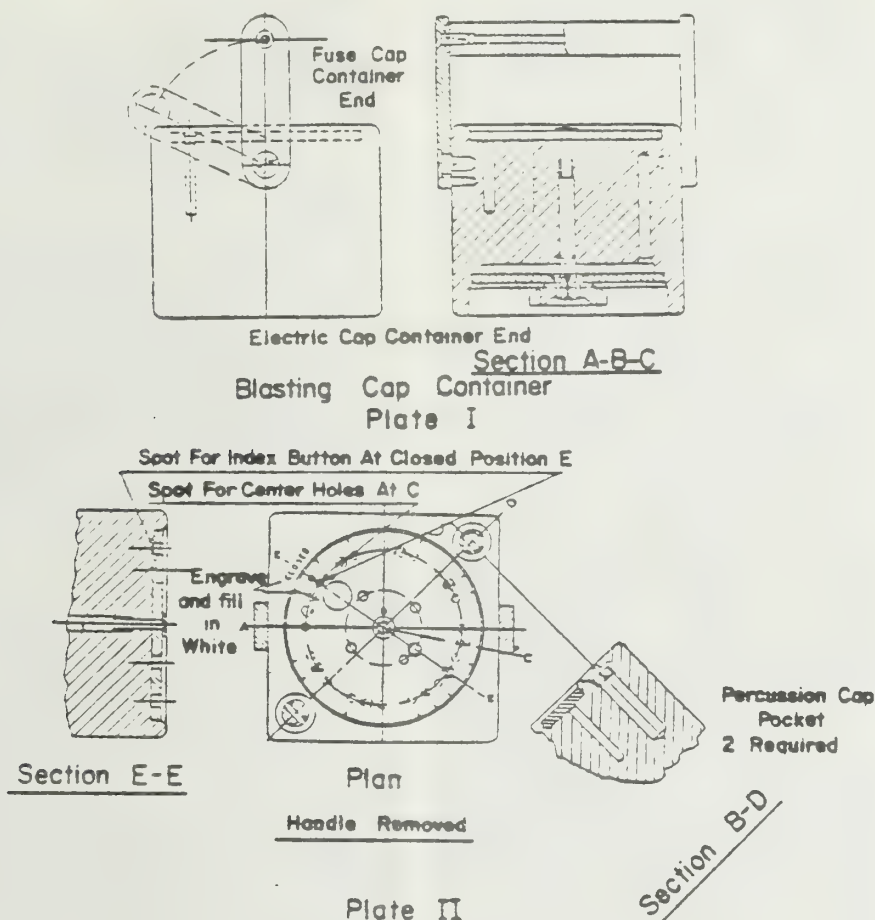
§ 178.318-2 Container.

(a) Every container for blasting caps, electric blasting caps, and percussion caps coming within the scope of this specification shall be constructed entirely of hard rubber, phenolresinous or other resinous material, or other nonmetallic nonsparking material, except that metal parts may be used in such locations as not in any event to come in contact with any of the caps. Space shall be provided so that each blasting cap of whatever nature may be inserted in an individual cell in the body of the container, into which each such cap shall snugly fit. There shall be provided no more than twenty (20) such cellular spaces. Space may be provided into which a plurality of percussion caps may be carried, provided that such space may be closed with a screw cap, and further provided that each or any such space is entirely separate from any space provided for any blasting cap. Each cellular space into which a blasting cap is to be inserted and carried shall be capable of being covered by a rotary cover so arranged as to expose not more than one cell at any time, and capable of rotation to such a place that all cells will be covered at the same time, at which place means shall be provided to lock the cover in place. Means shall be provided to lock in place the cover for the cells provided for the carrying of electric blasting caps. The requirement that not more than one cell be exposed at one time need not apply in the case of electric blasting caps, although spaces for such caps and blasting caps shall be separate. Sufficient annular space shall be provided inside the cover for such electric blasting caps that, when the cover is closed, there will be sufficient space to accommodate the wires customarily attached to such caps. If the material is of such a nature as to require treatment to prevent the absorption of moisture, such treatment shall be applied as shall be necessary in order to provide against the penetration of water by permeation. A suitable carrying handle shall be provided, except for which handle no part of the container may project beyond the exterior of the body.

(b) Exhibited in plates I and II are line drawings of a container for blasting caps, electric blasting caps, and percus-

sion caps, illustrative of the requirements set forth in § 178.318-2(a). These plates

shall not be construed as a part of this specification.



§ 178.318-3 Marking.

Each container must be marked as prescribed in § 173.24 of this subchapter.

§ 178.337 Specification MC 331; cargo tanks constructed of steel, primarily for transportation of compressed gases as defined in the Compressed Gas Section.

§ 178.337-1 General requirements.

(a) *ASME Code construction.* Tanks must be seamless or welded steel construction or combination of both and must be designed and constructed in accordance with and fulfill the require-

ments of the ASME Code. Each tank must also meet the following additional requirements.

(b) *Design pressure.* The design pressure of a tank authorized under this specification shall be not less than the vapor pressure of the commodity contained therein at 115° F. or as prescribed for a particular commodity in § 173.315 (a) (1) of this chapter, except that in no case shall the design pressure of any tank be less than 100 p.s.i.g. nor more than 500 p.s.i.g.

NOTE 1: The term "design pressure" as used in this specification, is identical to the term "maximum allowable working pressure" as used in the ASMT Code.

(c) *Openings.* (1) Excess pressure relief valves shall be located in the top of the tank or heads.

(2) A chlorine tank shall have only one opening. That opening shall be in the top of the tank and shall be fitted with a nozzle that meets the following requirements:

(i) On a tank manufactured on or before December 31, 1974, the nozzle shall be protected by a dome cover plate which conforms to either the standard of The Chlorine Institute, Inc., Dwg. 103-3, dated January 23, 1958, or to the standard specified in paragraph (c) (2) (ii) of this section.

(ii) On a tank manufactured on or after January 1, 1975, the nozzle shall be protected by a manway cover which conforms to the standard of The Chlorine Institute, Inc., Dwg. 103-4, dated September 1, 1971.

(d) *Reflective design.* Every uninsulated tank permanently attached to a tank motor vehicle shall, unless it be covered with a jacket made of aluminum, stainless steel, or other bright non-tarnishing metal, be painted a white, aluminum or similar reflecting color on the upper two-thirds of area of the tank.

(e) *Insulation for carbon dioxide, chlorine, and nitrous oxide tanks.* See § 173.33(j) of this subchapter.

(f) *Postweld heat treatment.* Postweld heat treatment must be as prescribed in the ASME Code except that each tank constructed in accordance with Part UH of the ASME Code must be postweld heat treated. Each chlorine tank must be fully radiographed and postweld heat treated in accordance with the provisions of the ASME Code under which it is constructed. Where postweld heat treatment is required, the tank must be treated as a unit after completion of all the welds in and/or to the shells and heads. The method must be as prescribed in the ASME Code. Welded attachments to pads may be made after postweld heat treatment. A tank used for anhydrous ammonia must be post-weld heat treated. The post-weld heat treatment must be as prescribed in the ASME Code, but in no event at less than 1050° F. tank metal temperature.

§ 178.337-2 Material.

(a) *General.* (1) All material used for construction of the tank and appurtenances must be suitable for use with the commodities to be transported therein and must comply with the requirements of the ASME Code and/or requirements of the American Society for Testing and Materials in all respects.

(2) Impact tests are required on steel used in fabrication of each tank constructed in accordance with Part UHT of the ASME Code. The tests must be made on a lot basis. A lot is defined as 100 tons or less of the same heat treatment processing lot having a thickness variation no greater than plus or minus 25 percent. The minimum impact required for full size specimens must be 20 foot-pounds in the longitudinal direction at -30° F., Charpy V-Notch and 15 foot-pounds in the transverse direction at -30° F., Charpy V-Notch. The required values for subsize specimens must be reduced in direct proportion to the cross-sectional area of the specimen beneath the notch. If a lot does not meet this requirement, individual plates may be accepted if they individually meet this requirement.

(3) The fabricator shall record the heat, and slab numbers, and the certified Charpy impact values, where required, of each plate used in each tank on a sketch showing the location of each plate in the shell and heads of the tank. Copies of each sketch shall be provided to the owner and retained for at least five years by the fabricator and made available to duly identified representatives of the Department.

(4) The direction of final rolling of the shell material shall be the circumferential orientation of the tank shell.

(b) *For a chlorine tank.* Plates, the manway nozzle, and anchorage shall be made of carbon steel which meets the following requirements:

(1) For a tank manufactured on or before December 31, 1974—

(i) Material shall conform to ASTM Specification A-300 -58, titled "Steel Plates for Pressure Vessels for Service at Low Temperatures";

(ii) Material shall be Class 1, Grade A, flange or firebox quality;

(iii) Plate impact test specimens, as required under paragraph (a) of this

section, shall be of the Charpy keyhole notch type; and

(iv) Plate impact test specimens shall meet the impact test requirements in paragraph (a) of this section in both the longitudinal and transverse directions of rolling at a temperature of minus 45.5 C. (−50° F.).

(2) For a tank manufactured on or after January 1, 1975—

(i) Material shall conform to ASTM Specification A-612-72a, Grade B or A-516-72, Grade 65 or 70;

(ii) Material shall meet the Charpy V-notch test requirements of ASTM Specification A-20-72a; and

(iii) Plate impact test specimens shall meet the impact test requirements in paragraph (a) of this section in both the longitudinal and transverse directions of rolling at a temperature of minus 40° C. (−40° F.).

(c) *For ammonia.* See § 173.33(h) (1) of this subchapter.

§ 178.337-3 Thickness of tank metal.

(a) Tank metal thickness must be as required by the ASME Code and paragraph (b) of this section, except that metal of thickness less than three-sixteenths inch may not be used for the shell or heads. A corrosion allowance of 20 percent or 0.10 inch, whichever is less, must be added to the thickness otherwise required for sulfur dioxide and chlorine tank material. In chlorine tanks the wall thickness must be at least five-eighths inch, including corrosion allowance.

(b) The minimum thickness of metal in the tank shell must be such that at no point therein will the stress on a plane normal to the cylindrical axis exceed 25 percent of the minimum specified tensile strength of the metal. For purposes of this requirement, calculation must be made by the formula:

$$S = \frac{T}{2} + \left[\frac{T^2}{4} + S_s^2 \right]^{0.5}$$

where, at any given point under consideration and for the worst combination of loadings:

S = Effective stress as limited by this requirement;

T = The sum of the longitudinal tensile stresses due to internal pressure and other causes including direct tensile stress due to a rearward accelerative force equal to twice the static weight, tensile stress due to the bending moment of a rearward accelerative force equal to twice the static weight, applied at the road surface, and tensile flexure stress due to three times the static weight in vertical loading; and

S = The vectorial sum of the shear stresses in the plane in question, including direct vertical shear due to three times the static vertical loading, direct lateral shear due to a lateral accelerative force of twice the static weight, and torsional shear due to a lateral accelerative force equal to twice the static weight, applied at the road surface. Maximum concentrated stresses which might be created at pads and cradles due to shear, bending, and torsion shall also be calculated in accordance with appendix G of the ASME Code, 1962 edition.

NOTE 1: The forces, loads, and stresses concerned in the foregoing requirement relate to the weight of the tank itself, its contents, and articles supported by the tank, not including the weight of structures supporting the tank in normal operating condition. The stresses involved are not all uniform through the length of the tank shell.

(c) Where any tank support is attached to any part of a tank head, the stresses imposed upon the head must be as required in paragraph (b) of this section with respect to maximum concentrated stresses at pads and cradles.

§ 178.337-4 Joints.

(a) Joints shall be as required by the ASME Code, with all undercutting in shell and head material repaired as specified therein.

(b) Welding procedure and welder performance tests must be made annually in accordance with Section IX of the ASME Code. In addition to the essential variables named therein, the following must be considered as essential variables: number of passes; thickness of plate; heat input per pass; and manufacturer's identification of rod and flux. When fabrication is done in accordance with Part UHT of the ASME Code, filler material containing more than 0.08 percent vanadium must not be used. The number of passes, thickness of plate, and

heat input per pass may not vary more than 25 percent from the procedure or welder qualifications. Records of the qualifications must be retained for at least 5 years by the tank manufacturer and must be made available to duly identified representatives of the Department and the owner of the tank.

(c) All longitudinal shell welds shall be located in the upper half of the tank.

(d) Edge preparation of shell and head components may be by machine heat processes, provided such surfaces are remelted in the subsequent welding process. Where there will be no subsequent remelting of the prepared surface as in a tapered section, the final 0.050 inch of material shall be removed by mechanical means.

(e) The maximum tolerance for misalignment and butting up shall be in accordance with the ASME Code.

(f) Substructures shall be properly fitted before attachment, and the welding sequence shall be such as to minimize stresses due to shrinkage of welds.

§ 178.337-5 Bulkheads, baffles and ring stiffeners.

(a) Not a specification requirement.

§ 178.337-6 Closure for manhole.

(a) Each tank constructed in accordance with Part UHT of the ASME Code and other tanks above 3,500 gallons water capacity must be provided with a manhole conforming to paragraph UG-46 (g)(1) and other requirements of the ASME Code.

§ 178.337-7 Overturn protection.

(a) See § 178.337-10.

§ 178.337-8 Outlets.

(a) *Outlets generally.* (1) An opening shall be provided on each tank used for the transportation of liquefied materials to afford complete drainage.

(2) With the exception of gauging devices, thermometer wells, and safety relief valves, every opening in every tank used for the transportation of compressed gases other than carbon dioxide

shall be (i) closed with a plug, cap, bolted flange, or plate or (ii) protected with an excess flow valve or back flow check valve (see § 178.337-11(a)) or (iii) be fitted with a remote control valve as specified in § 178.337-11(c).

(b) *Chlorine tank valves.* See § 173.33 (g)(9), (1)(4), and (5) of this subchapter. Regarding chlorine tank outlets, see also § 178.337-1(c)(2) of this part.

§ 178.337-9 Safety relief devices, valves and connections.

(a) *Safety relief valves.* (1) See § 173.315(i) of this subchapter.

(2) On tanks for carbon dioxide or nitrous oxide see § 173.315(i)(9) and (1)(10) of this subchapter.

(3) Each valve must be designed, constructed, and marked for a rated pressure not less than the tank design pressure at the temperature expected to be encountered.

(b) *Piping, valves, and fittings.* (1) See § 173.33(g)(1) and (3) of this subchapter.

(2) Piping and fittings must be in conformance with § 173.33(g) of this subchapter and must be protected from damage as required by § 178.337-10 of this section.

(c) *Marking inlets and outlets.* All tank inlets and outlets, except safety relief valves, shall be marked to designate whether they communicate with vapor or liquid when the tank is filled to the maximum permitted filling density.

(d) *Refrigeration and heating coils.*

(1) Refrigeration and heating coils, when installed in any tank, shall be securely anchored with provision for thermal expansion. They shall be tested externally to at least the tank test pressure, and internally to at least the tank test pressure or at least twice the working pressure of the heating or refrigeration system, if higher, and the tank shall not be placed in or returned to transportation service if any leakage or other evidence of damage is found in these tests. The refrigerant or heating medium to be circulated through the coils must be such as to cause no adverse chemical reaction with the tank or tank contents in case of leakage.

(2) Where any liquid susceptible to freezing, or the vapor of any such liquid, is used for heating or refrigeration, the heating or refrigeration system shall be arranged to permit complete drainage.

§ 178.337-10 Protection of fittings.

(a) All valves, fittings, safety relief devices, and other accessories to the tank proper shall be protected in accordance with paragraph (b) of this section against such damage as could be caused by collision with other vehicles or objects, jackknifing and overturning. In addition, safety relief valves shall be so protected that in the event of overturn of the vehicle on to a hard surface, their opening will not be prevented and their discharge will not be restricted.

(b) The protective devices or housing must be designed to withstand static loading in any direction equal to twice the weight of the tank and attachments when filled with the lading, using a safety factor of not less than four, based on the ultimate strength of the material to be used, without damage to the fittings protected, and must be made of metal at least $\frac{3}{16}$ -inch thick.

(c) *For chlorine tanks.* There shall be a protective housing and manway cover to permit the use of standard emergency kits for controlling leaks in fittings on the dome cover plate. The housing and manway cover must conform to the Chlorine Institute's standards as follows:

(1) Tanks manufactured on or before December 31, 1974: Dwg. 137-1, dated November 7, 1962, or Dwg. 137-2, dated September 1, 1971.

(2) Tanks manufactured on or after January 1, 1975: Dwg. 137-2, dated September 1, 1971.

(d) Each tank motor vehicle shall be provided with at least one rear bumper designed to protect the tank and piping in the event of a rear end collision and minimize the possibility of any part of the colliding vehicle striking the tank. The design shall be such as to transmit the force of a rear end collision in a horizontal line to the chassis of the vehicle. The bumper shall be designed to withstand the impact of the fully loaded vehicle with a deceleration of 2 "g", using a safety factor of four based on the ultimate

strength of the bumper material.

§ 178.337-11 Emergency discharge control.

(a) *Excess flow valves and back flow check valves.* (1) Where used as required in § 178.337-8(a) (2) excess flow valves or back flow check valves shall be located inside the tank or inside a welded nozzle which is an integral part of the tank.

(2) Excess flow valves must be in conformance with § 173.33(i) of this subchapter.

(3) Chlorine tanks. See § 173.33(i) (4) of this subchapter.

(b) *Shutoff valves.* See § 173.33(i) (3) of this subchapter.

(c) *Liquid or vapor discharge openings.* Except for an engine fuel line on a truck-mounted tank, of not over $\frac{3}{4}$ -inch diameter and equipped with a valve having an integral excess flow valve, each liquid or vapor discharge opening in a tank used for a flammable liquid, flammable compressed gas, or anhydrous ammonia must be equipped with a remotely controlled internal shut-off valve. However, on any liquid or vapor discharge opening of less than $1\frac{1}{4}$ -inches diameter, an excess flow valve together with a manually operated external valve may be used in place of a remotely controlled internal shut-off valve. Each remotely controlled internal valve must be in conformance with the following requirements:

(1) The seat of the valve shall be inside the tank, or in the opening nozzle or flange or in a companion flange bolted to the nozzle or flange.

(2) All parts of the valve inside the tank, nozzle, or companion flange, shall be made of material not subject to corrosion or other deterioration in the presence of the lading.

(3) The arrangement of parts shall be such that damage to parts exterior to the tank will not prevent effective seating of the valve.

(4) The valve may be operated normally by mechanical means, by hydraulic means, or by air, or gas pressure.

(5) On a tank over 3,500 gallons water capacity, each internal shut-off valve must be provided with remote means of automatic closure, both mechanical and

thermal, that are installed at the ends of the tank in at least two, diagonally opposite locations. If the discharge connection at the tank is not in the general vicinity of one of the two locations specified above, one additional fusible element must be installed so that heat from a fire in that area will activate the emergency control system. Fusible elements may not have a melting point exceeding 250° F.

(6) On a tank of 3,500 gallons water capacity or less, each internal shut-off valve must be provided with at least one remote control station, and the actuating means may be mechanical. This station must be at one end of the tank, away from the discharge connection area.

§ 178.337-12 Shear section.

(a) Design or installation of valves specified in § 178.337-8(a)(2) shall provide adjacent to and outboard of such valves a section which will break under undue strain.

§ 178.337-13 Supporting and anchoring.

(a) A cargo tank that is not permanently attached to or integral with a vehicle chassis must be secured by turnbuckles or equally efficient securing devices for drawing the tank down tight on the frame. Anchors, stops, or other means must be provided to prevent relative motion between the tank and the vehicle chassis when the vehicle is in operation.

(b) A tank motor vehicle designed and constructed so that the cargo tank constitutes in whole or in part the stress member used in place of a frame must have the tank supported by external cradles. A cargo tank mounted on a frame must be supported by external cradles or longitudinal members. The cradles, where used, must subtend at least 120 degrees of the shell circumference. The design calculations for the supports must include beam stress, shear stress, torsion stress, bending moment, and acceleration stress, for the loaded vehicle as a unit, using a factor of safety of 4, based on the ultimate strength of the material and on a 2 "g" longitudinal and lateral loading and 3

times the static weight in vertical loading (see Appendix G of the ASME Code).

(c) Where any tank support is attached to any part of a tank head, the stresses imposed upon the head shall be provided for as required in paragraph (b) of this section.

(d) No tank support or bumper may be welded directly to the tank. All supports and bumpers shall be attached by means of pads of the same material as the tank. The pad thickness shall be no less than $\frac{1}{4}$ inch, or the thickness of the shell material if less, and no greater than the shell material. Each pad shall extend at least 4 times its thickness, in each direction, beyond the weld attaching the support or bumper. Each pad shall be preformed to an inside radius no greater than the outside radius of the tank at the place of attachment. Each pad corner shall be rounded to a radius at least one-fourth the width of the pad, and no greater than one-half the width of the pad. Weep holes and telltale holes, if used shall be drilled or punched before the pads are attached to the tank. Each pad shall be attached to the tank by continuous fillet welding using filler material having properties conforming to the recommendations of the maker of the shell and head material.

§ 178.337-14 Gauging devices.

(a) *Liquid level gauging devices.* See § 173.315(h) of this subchapter.

(b) *Pressure gauges.* See §§ 173.33(g)(7) and 173.315(h) of this subchapter.

(c) *Orifices.* See § 173.315(h)(3) and (4) of this subchapter.

§ 178.337-15 Pumps and compressors.

See § 173.33(g)(6) and (10) of this subchapter.

§ 178.337-16 Testing.

(a) *Inspection and tests.* Inspection of materials of construction of the tank and its appurtenances and original test and inspection of the finished tank and its appurtenances must be as required by the ASME Code and as further required by this specification except that for tanks constructed in accordance with Part UHT of the ASME Code the original test pressure must be at least twice the tank design pressure.

(b) *Weld testing and inspection.*

(1) Each tank constructed in accordance with Part UHT of the ASME Code must be subjected, after postweld heat treatment and hydrostatic tests, to a wet fluorescent magnetic particle inspection to be made on all welds in or on the tank shell and heads both inside and out. The method of inspection must conform to Appendix VI of the ASME Code, paragraph UA-70 through UA-72 except that permanent magnets shall not be used.

(2) On tanks of over 3,500 gallons water capacity other than those describe in subparagraph (1) of this paragraph unless fully radiographed, a test must be made of all welds in or on the shell and heads both inside and outside by either the wet fluorescent magnetic particle method conforming to Appendix VI of the ASME Code, liquid dye penetrant method, or ultrasonic testing in accordance with Appendix U of the ASME Code. Permanent magnets must not be used to perform the magnetic particle inspection.

(c) All defects found shall be repaired, the tanks shall then again be postweld heat treated, if such heat treatment was previously performed, and the repaired areas shall again be tested.

§ 178.337-17 Marking.

(a) *Metal identification plate.* Each tank shall have a noncorrosive metal plate permanently affixed by brazing or welding around its perimeter, on the right side near the front, in a place readily accessible for inspection and maintained legible. On multitank vehicles plates shall be attached to each tank at the front in a place readily accessible for inspection. Each insulated tank shall have an additional plate, as described, affixed to the jacket in the location specified. Neither the plate itself nor the means of attachment to the tank or jacket may be subject to attack by the tank contents. If the plate is attached directly to the tank by welding it shall be welded thereto before the tank is postweld heat treated. The plate shall be plainly marked by stamping, embossing, or other means of forming letters into the metal of the plate, with the following information in addition to that required

by the ASME Code, in characters at least $\frac{3}{8}$ inch high:

Vehicle manufacturer.
Vehicle manufacturer's serial number.
D.O.T. specification number MC-331.
Vessel material specification number.
Water capacity in pounds (see Note 1).
Original test date.

NOTE 1: See § 173.315(a) of this chapter regarding water capacity.

(b) Each tank motor vehicle must also be marked as required by § 177.823 of this chapter.

§ 178.337-18 Certification.

(a) For each tank the tank vehicle manufacturer shall supply and the owner shall obtain the tank manufacturer's data report required by the ASME Code, and a certificate stating that the completed tank vehicle is in complete compliance in all respects with specification MC 331 including the ASME Code. The certificate must be signed by a responsible official of the fabricating firm. The certificate must state whether or not it includes certification that all valves, piping, and protective devices comply with the requirements of the specification. If it does not so certify, the installer of any such valve, piping, or device shall supply and the owner shall obtain a certificate asserting complete compliance with these specifications for such devices. The certificate, or certificates, will include sufficient sketches, drawings, and other information to indicate the location, make, model, and size of each valve and the arrangement of all piping associated with the tank.

(1) The certificate must contain a statement indicating whether or not the cargo tank was post-weld heat treated for anhydrous ammonia as specified in § 178.337-1(f).

(b) The owner shall retain the copy of the data report and certificates and related papers in his files throughout his ownership of the tank and for at least one year thereafter; and in the event of change in ownership, retention by the prior owner of nonfading photographically reproduced copies will be deemed to satisfy this requirement. Each motor carrier using the tank, if not the owner thereof, shall obtain a copy of the data report and certificate and retain them

in his files during the time he uses the tank and for at least one year thereafter.

§ 178.340 General design and construction requirements applicable to specifications MC 306 (§ 178.341), MC 307 (§ 178.342), and MC 312 (§ 178.343) cargo tanks.

§ 178.340-1 Specification requirements for MC 306, MC 307, and MC 312 cargo tanks.

(a) Specifications MC 306, MC 307, and MC 312 cargo tanks constructed on or after December 1, 1967, for the bulk transportation of hazardous materials must meet the requirements contained in this section in addition to the requirements of each applicable specification as contained in § 178.341 (MC 306), § 178.342 (MC 307), and § 178.343 (MC 312).

(b) All of these specification requirements are minimum requirements.

§ 178.340-2 General requirements.

(a) Every cargo tank and vessel shall be designed and constructed in accordance with the best known and available practices in addition to the other applicable cargo tank specification requirements.

(b) Those requirements relating to parts and accessories applicable to all motor vehicles engaged in intrastate commerce as contained in the Illinois Vehicle Code are an integral part of this specification.

(c) Where applicable the additional requirements prescribed in Part 173 of this chapter to accommodate specific commodities are considered an integral part of these specifications.

(d) Multipurpose cargo tank:

(1) A single cargo tank may be divided into compartments of different specification construction. Each such compartment shall conform to specification requirements concerned.

(2) A single cargo tank may be physically altered to comply with another cargo tank specification in the regulations in this part; or altered to accommodate a commodity not requiring a DOT specification tank.

§ 178.340-3 Material.

(a) All sheet and plate material for shell, heads, bulkheads and baffles for cargo tanks which are not required to be constructed in accordance with the American Society of Mechanical Engineers' Boiler and Pressure Vessel Code shall meet the following minimum applicable requirements:

(1) *Aluminum Alloys (AL)*. Only aluminum alloy material suitable for fusion welding and in compliance with one of the following ASTM specifications shall be used:

ASTM B-209 Alloy 5052.
ASTM B-209 Alloy 5086.
ASTM B-209 Alloy 5154.
ASTM B-209 Alloy 5254.
ASTM B-209 Alloy 5454.
ASTM B-209 Alloy 5652.

(b) All heads, bulkheads, baffles, and rings stiffeners may use O temper (annealed) or stronger tempers. All shells shall be made of materials with properties equivalent to H32 or H34 tempers, except that lower ultimate strength tempers may be used if the minimum shell thicknesses in Table II in § 178.341-2, § 178.342-2, or § 178.343-2 are increased in inverse proportion to the lesser ultimate strength.

(2) *Steel*.

	Mild steel (MS)	High strength low alloy steel (HSLA)	Austenitic stainless steel (SS)
Yield point...p.s.i...	25,000	45,000	25,000
Ultimate strength...p.s.i...	45,000	60,000	70,000
Elongation, 2-inch samples			
percent...	20	25	30

§ 178.340-4 Structural integrity.

(a) *Maximum stress values*. The maximum calculated stress value must not exceed 20 percent of the minimum ultimate strength of the material as authorized in § 178.340-3, except when ASME Code pressure vessel design requirements apply.

(b) *Loadings*. Cargo tanks shall be provided with additional structural elements as necessary to prevent resulting

stresses in excess of those permitted in paragraph (a) of this section. Consideration shall be given to forces imposed by each of the following loads individually, and where applicable a vector, summation of any combination thereof:

- (1) Dynamic loading under all product load configurations.
- (2) Internal pressure.
- (3) Superimposed loads such as operating equipment, insulation, linings, hose tubes, cabinets, and piping.
- (4) Reactions of supporting lugs and saddles or other supports.
- (5) Effect of temperature gradients resulting from product and ambient temperature extremes. Thermal coefficients of dissimilar materials where used should be accommodated.

§ 178.340-5 Joints.

(a) *Method of joining.* All joints between tank shells, heads, baffles (or baffle attaching rings), and bulkheads shall be welded in accordance with the requirements contained in this section.

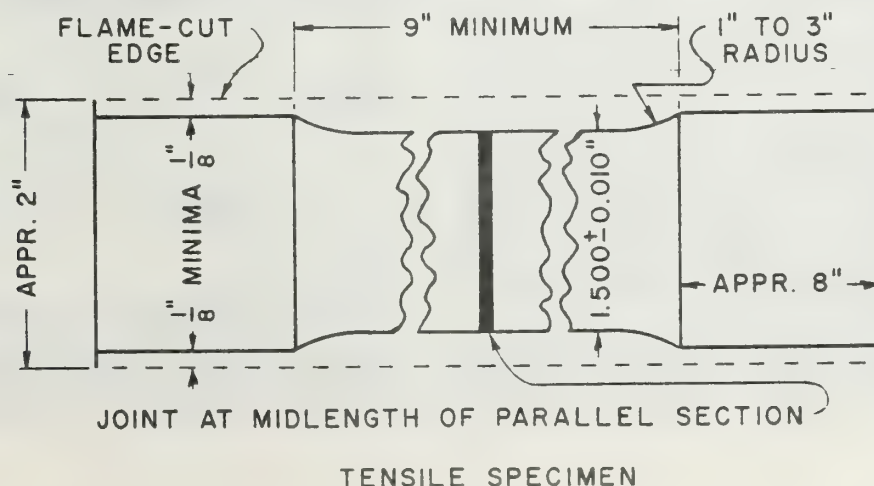
(b) *Strength of joints (Aluminum Alloy (AL)).* All welded aluminum alloy joints shall be made in accordance with recognized good practice, and the efficiency of a joint shall be not less than 85 percent of the properties of the adjacent material. Aluminum alloys shall be joined by an inert gas arc welding process using aluminum-magnesium type of filler metals which are consistent with the material suppliers recommendations.

(c) *Strength of joints (Mild Steel (MS), High Strength Low Alloy (HSLA),*

Austenitic Stainless Steel (SS)). Joints shall be welded in accordance with recognized good practice and the efficiency of any joint shall be not less than 85 percent of the mechanical properties of the adjacent metal in the tank.

(1) Combinations of mild steel (MS), high strength low alloy (HSLA) and/or austenitic stainless steel (SS), may be used in the construction of a single tank, provided that each material, where used, shall comply with the minimum requirements specified in § 178.340-3(a) for the material used in the construction of that section of the tank. Whenever stainless steel sheets are used in combination with sheets of other types of steel, joints made by welding shall be formed by the use of stainless steel electrodes or filler rods and the stainless steel electrodes or filler rods used in the welding shall be suitable for use with the grade of stainless steel concerned, according to the recommendations of the manufacturer of the stainless steel electrodes or filler rods.

(d) *Compliance test.* Compliance with the requirements contained in paragraph (b) or (c) of this section for the welded joints indicated in paragraph (a) of this section shall be determined by preparing from materials representative of those to be used in tanks subject to this specification and by the same technique of fabrication, two test specimens conforming to figure as shown below and testing them to failure in tension. One pair of test specimens may represent all the tanks to be made of the same combination of materials by the same technique of fabrication, and in the same shop, within 6 months after the tests on such samples have been completed. The butt welded specimens tested shall be



considered qualifying other types or combinations of types of weld using the same filler material and welding process as long as parent metals are of the same types of material.

§ 178.340-6 Supports and anchoring.

(a) Cargo tanks with frames not made integral with the tanks as by welding, shall be provided with restraining devices to eliminate any relative motion between the tank and frame which may result from the stopping, starting or turning of the vehicle. Such restraining devices shall be readily accessible for inspection and maintenance; except that insulation and jacketing are permitted to cover the restraining devices.

(b) Any cargo tank designed and constructed so that it constitutes in whole or in part the structural member used in lieu of a frame, shall be supported in such a manner that the resulting stress levels in the cargo tank do not exceed those specified in § 178.340-4(a). The design calculations of the support elements shall include loadings imposed by stopping, starting and turning in addition to those imposed as indicated in § 178.340-4(b) using 20 percent of the minimum ultimate strength of the support material.

§ 178.340-7 Circumferential reinforcements.

(a) Tanks with shell thicknesses less than three-eighths of an inch shall in addition to the tank heads be circumferentially reinforced with either bulkheads, baffles, or ring stiffeners. It is permissible to use any combination of the aforementioned reinforcements in a single cargo tank.

(1) *Location.* Such reinforcement shall be located in such a manner that the maximum unreinforced portion of the shell be as specified in Table II of the applicable specification and in no case more than 60 inches. Additionally such circumferential reinforcement shall be located within 1 inch of points where discontinuity in longitudinal shell sheet alignment exceeds 10 degrees unless otherwise reinforced with structural members capable of maintaining shell sheet stress levels permitted in § 178.340-4(a).

(b) *Baffles:* Baffles or baffle attaching rings if used as reinforcement members shall be circumferentially welded to the tank shell. The welding must not be less

than 50 percent of the total circumference of the vessel and the maximum unwelded space on this joint shall not exceed 40 times the shell thickness.

(c) *Double bulkheads:* Tanks designed to transport different commodities which if combined during transit will cause a dangerous condition or evolution of heat or gas shall be provided with compartments separated by an air space. This air space shall be vented and be equipped with drainage facilities which shall be kept operative at all times.

(d) *Ring stiffeners:* Ring stiffeners when used to comply with this section shall be continuous around the circumference of the tank shell and shall have a section modulus about the neutral axis of the ring section parallel to the shell at least equal to that determined by the following formula:

$$\frac{I}{C} (\text{Min}) = 0.00027 \frac{WL}{\text{Steel}} \quad (\text{MS, HSLA, and SS})$$

$$\frac{I}{C} (\text{Min}) = 0.000467 \frac{WL}{\text{Aluminum Alloy}} \quad (\text{AL})$$

where:

$$\frac{I}{C} = \text{Section modulus (inches}^3\text{)}.$$

W = Tank width or diameter (inches).

L = Ring spacing (inches): i.e., the maximum distance from the midpoint of the unsupported shell on one side of the ring stiffener to the midpoint of the unsupported shell on the opposite side of the ring stiffener.

(1) If a ring stiffener is welded to the tank shell (with each circumferential weld not less than 50 percent of the total maximum unwelded space on this joint not exceeding 40 times the shell thickness) a portion of the shell may be considered as part of the ring section for purposes of computing the ring section modulus. The maximum portion of the shell to be used in these calculations is as follows:

Circumferential ring stiffener to tank shell welds	Distance between parallel circumferential ring stiffener to shell welds	Shell section credit
1.....	Less than 20t.....	20t.
2.....	20t or more.....	30t + W. 40t.

where:

t = Shell thickness.

W = Distance between parallel circumferential ring stiffener to shell welds.

(2) If configuration of internal or external ring stiffener encloses an air space, this air space shall be arranged

for venting and be equipped with drainage facilities which shall be kept operative at all times.

§ 178.340-8 Accident damage protection.

(a) Appurtenances: The term "appurtenance" means any cargo tank accessory attachment that has no liquid product retention or other liquid containment function, and provides no structural support to the tank.

(1) The design, construction, and installation of any appurtenance to the shell or head of the cargo tank must be such as to minimize the possibility of appurtenance damage or failure adversely affecting the product retention integrity of the tank.

(2) Structural members, such as the suspension subframe, overturn protection and external rings, when practicable, should be utilized as sites for attachment of appurtenances and any other accessories to a cargo tank.

(3) Except as prescribed in subparagraph (5) of this paragraph, the welding of any appurtenance to a shell or head must be made by attachment of a mounting pad. The thickness of a mounting pad must not be less than that of the shell or head to which it is attached. A pad must extend at least 2 inches in each direction from any point of attachment of an appurtenance. Pads must have rounded corners or otherwise be shaped in a manner to preclude stress concentrations on the shell or head. The mounting pad must be attached by a continuous weld around the pad.

(4) The appurtenance must be attached to the mounting pad so there will be no adverse affect upon the product-retention integrity of the tank if any force is applied to the appurtenance, in any direction, except normal to the tank, or within 45° of normal.

(5) Skirting structures, conduit clips, brakeline clips, and similar lightweight attachments, which are of a metal thickness, construction, or material, appreciably less strong but not more than 72 percent of the thickness of the tank shell or head to which such a device is attached, may be secured directly to the tank shell or head if each device is so designed and installed that damage to it will not affect the product retention integrity of the tank. These lightweight attachments must be secured to the tank shell by continuous weld or in such man-

ner as to preclude formation of pockets, which may become sites for incipient corrosion.

(b) Rear bumpers: Every cargo tank shall be provided with a rear bumper to protect the tank and piping in the event of a rear end collision and minimize the possibility of any part of the colliding vehicle striking the tank. The bumper shall be located at least 6 inches to the rear of any vehicle component which is used for loading or unloading purposes or may at any time contain lading while in transit. Structurally, the bumper shall be designed to successfully absorb (no damage which will cause leakage of product) the impact of the vehicle with rated payload, with a deceleration of 2 "g" using a factor of safety of two based on the ultimate strength of the bumper material. For purposes of the regulations in this part such impact shall be considered uniformly distributed and applied horizontally (parallel to the ground) from any direction at an angle not exceeding 30° to the longitudinal axis of the vehicle.

(c) Overturn protection: All closures for filling, manhole, or inspection openings shall be protected from damage which will result in leakage of lading in the event of overturning of the vehicle by being enclosed within the body of the tank or dome attached to the tank or by guards.

(1) When guards are required, they shall be designed and installed to withstand a vertical load of twice the weight of the loaded tank and a horizontal load in any direction equivalent to one-half the weight of the loaded tank. These design loads may be considered independently. Ultimate strength of the material shall be used as a calculation base. If more than one guard is used each shall carry its proportionate share of the load. If protection other than guards are considered the same design load criteria is applicable.

(2) Except for pressure actuated vents no overturn protection is required for nonoperating nozzles or fittings less than 5 inches in diameter (which do not contain product while in transit) that project a distance less than the inside diameter of the fitting. This projected distance may be measured either from the shell or the top of an adjacent ring stiffener provided such stiffener is within 30 inches of the center of the nozzle or fitting.

(3) If the overturn protection is so constructed as to permit accumulation of liquid on the top of the tank, it shall be provided with drainage facilities directed to a safe point of discharge.

(d) Piping:

(1) Product discharge piping shall be provided with protection in such a manner as to reasonably assure against the accidental escape of contents. Such protection may be provided by:

(i) A shear section located outboard of each emergency valve seat and within 4 inches of the vessel which will break under strain and leave the emergency valve seat and its attachment to the vessel and the valve head intact and capable of retaining product. The shear section shall be machined in such a manner as to abruptly reduce the wall thickness of the adjacent piping (or valve) material by at least 20 percent; or

(ii) By suitable guards capable of successfully absorbing a concentrated horizontal force of at least 8,000 pounds applied from any horizontal direction, without damage to the discharge piping which will adversely affect the product retention integrity of the discharge valve.

(2) Minimum road clearance: The minimum allowable road clearance of any cargo tank component or protection device located between any two adjacent axles on a vehicle or vehicle combination shall be at least one-half inch for each foot separating such axles and in no case less than 12 inches.

(3) Strength of piping, fittings, hose and hose couplings: Hose, piping, and fittings for tanks to be unloaded by pressure shall be designed for a bursting pressure of at least 100 p.s.i.g. and not less than four times the pressure to which, in any instance, it may be subjected in service by the action, of any vehicle mounted pump or other device (not including safety relief valves), the action of which may be to subject certain portions of the tank piping and hose to pressures greater than the design pressure of the tank. Any coupling used on hose to make connections shall be designed for a working pressure not less than 20 percent in excess of the design pressure of the hose and shall be so designed that there will be no leakage when connected.

(4) Provision for expansion and vibration: Suitable provisions shall be made in every case to allow for and prevent damage due to expansion, contraction, jarring, and vibration of all pipe. Slip joints shall not be used for this purpose.

(5) Heater coils: Heater coils, when installed, shall be so constructed that the breaking off of their external connections will not cause leakage of contents of tank.

(6) Gauging, loading, and air-inlet devices: Gauging, loading, and air-inlet devices, including their valves, shall be provided with adequate means for their secure closure, and means shall also be provided for the closing of pipe connections of valves.

§ 178.340-9 Pumps.

(a) Loading or unloading pumps mounted on tractor or trailer, if used, shall be provided with automatic means to prevent the pressure from exceeding the design pressure of the tank mounted equipment.

§ 178.340-10 Certification.

(a) Certification as required in paragraphs (b) and (c) of this section shall indicate that such cargo tank has been designed, constructed, and tested in accordance with the applicable specification MC 306, MC 307, or MC 312 (§ 178.341, § 178.342 or § 178.343).

(1) *Multipurpose tanks.* If a cargo tank is divided into compartments and each compartment is constructed in accordance with the requirements of a different MC specification, there shall be a metal plate required in paragraph (b) of this section, located on the right side, near the front of each compartment, in a place readily accessible for inspection. Details pertaining to the multipurpose configuration shall also be clearly indicated on the manufacturer's certificate required in paragraph (c) of this section.

(i) If a cargo tank is constructed in accordance with the requirements of one specification and may be physically altered to meet another cargo tank specification in this part; or physically altered to accommodate, a commodity not requiring a specification tank, such alterations shall be clearly indicated on the manufacturer's certificate required in paragraph (c) of this section and the tank mounted multipurpose plate required in paragraph (b)(2) of this section.

(2) *Specification shortages.* If, a cargo tank is manufactured which does not meet all of the applicable specification

requirements, thereby requiring subsequent manufacturing involving the installation of additional components, parts, appurtenances or accessories, it is permissible for the original manufacturer to affix the metal certification plate required in paragraph (b) of this section. The specification requirements not complied with shall be indicated on the manufacturer's certificate required in paragraph (c) of this section. When the cargo tank is finally brought into complete compliance, the date such compliance is accomplished shall be stamped on the metal certification plate. The certificate shall indicate the pertinent details, date and concern (manufacturer or carrier) accomplishing complete compliance.

(b) Metal certification plate: There shall be on every cargo tank (or tank compartment if constructed to different specification) a metal plate not subject to corrosion located on the right side, near the front, in a place readily accessible for inspection. Such plate shall be permanently affixed to the tank by means of soldering, brazing, welding, or other equally suitable means; and upon it shall be marked in characters at least $\frac{3}{16}$ -inch high by stamping, embossing, or other means of forming letters into or on the metal of the plate itself, at least the information indicated below. The plate shall not be so painted as to obscure the markings thereon.

(1) If a cargo tank is to be physically altered to meet another specification (or to accommodate a commodity not requiring a specification tank) such combinations shall be indicated beside specification identification. Additionally the metal multipurpose plates required in subparagraph (2) of this paragraph are required.

Vehicle manufacturer.....
 Specification identification¹ DOT MC 306; or
 MC 307; or MC 312.....
 Date of manufacture.....
 Original test date.....
 Certificate date.....
 Design pressure..... p.s.i.g.
 Test pressure..... p.s.i.g.
 Head material.....
 Shell material.....
 Weld material.....
 Lining material.....
 Nominal tank capacity by compartment
 (front to rear)..... U.S. gal.
 Maximum product load..... lbs.
 Loading limits..... g.p.m. and/or p.s.i.g.
 Unloading limits..... g.p.m. and/or p.s.i.g.

¹ The following material designations (or combinations thereof) must be added: Aluminum Alloy (AL); Mild Steel (MS); High

Strength Low Alloy (HSLA); Austenitic Stainless Steel (SS). For example "DOT MC 306-AL" for cargo tanks made of aluminum. A multipurpose cargo tank example would be "Combination MC 306SS-307SS."

(2) Metal multipurpose plate: If a cargo tank is to be physically altered, metal multipurpose plates shall be mounted adjacent to the metal certification plate readily accessible for inspection. The mounting of the plates shall be such that only the plate identifying the applicable specification is legible at all times the cargo tank is in complete compliance with such specifications. The mounting of the plates (or plate assembly) shall be secured in such a manner as to be capable of retaining the plate when subjected to normal operating conditions. The same marking size and method used on the certification plate shall be used. The plate shall contain at least the information contained below:

SPECIFICATION IDENTIFICATION MC ----

EQUIPMENT NECESSARY

Vents:	Quantity ¹
Pressure actuated.....	
Fusible	
Frangible	
Product discharge:	
Top	
Bottom	
Pressure unloading	
fitting	
Covers:	
Manhole	
Fill opening.....	

¹ The number required to meet applicable specification. If no physical change is required the letters NC shall follow the number required. If cargo tank is not so equipped the word "NONE" shall be inserted.

(i) Color coding. Those parts which must be changed or added to meet the applicable specification requirements and the appropriate multi-purpose plate shall be identified using the following colors:

MC 306.....	RED
MC 307.....	GREEN
MC 312.....	YELLOW
Nonspecification.....	BLUE

Additionally those parts to be changed or added shall be stamped with the appropriate MC Specification No.

(c) Manufacturer's certificate: A certificate signed by a responsible official of the manufacturer of the cargo tank, or from a competent testing agency, certifying that each such cargo tank is designed, constructed and tested in accordance and complies with the requirements contained in the applicable specification shall be procured, and such

certificate shall be retained in the files of the carrier during the time that such cargo tank is employed by him plus one year. In lieu of this certificate, if the motor carrier himself elects to ascertain that any such tank fulfills the requirements of the specification by his own test, he shall similarly retain the test data.

§ 178.341 Specification MC 306; cargo tanks.

§ 178.341-1 General requirements.

(a) Specification MC 306 cargo tanks must comply with the general design and construction requirements in § 178.340 in

addition to the specific requirements contained in this section.

(b) Design pressure: The design pressure of each cargo tank shall be not less than that pressure exerted by the static head of the fully loaded tank in the upright position.

§ 178.341-2 Thickness of shells, heads, bulkheads, and baffles.

(a) *Material thickness.* The minimum thicknesses of tank material authorized in § 178.340-3 shall be predicated on not exceeding the maximum allowable stress level (§ 178.340-4(a)) but in no case less than those indicated in Tables I and II below:

TABLE I—MINIMUM THICKNESS OF HEADS, BULKHEADS AND BAFFLES. MILD STEEL (MS), HIGH STRENGTH LOW ALLOY STEEL (HSLA), AUSTENITIC STAINLESS STEEL (SS), IN U.S. STANDARD GAUGE; ALUMINUM ALLOY (AL)—EXPRESSED IN DECIMALS OF AN INCH

	Volume capacity in gallons per inch											
	10 or less			Over 10 to 14			14 to 18			18 and over		
	MS	HSLA, SS	AL	MS	HSLA, SS	AL	MS	HSLA, SS	AL	MS	HSLA, SS	AL
Thickness.....	14	15	0.096	13	14	0.109	12	13	0.130	11	12	0.151

TABLE II—MINIMUM THICKNESS OF SHELL SHEETS. MILD STEEL (MS), HIGH STRENGTH LOW ALLOY STEEL (HSLA), AUSTENITIC STAINLESS STEEL (SS) IN U.S. STANDARD GAUGE; ALUMINUM ALLOY (AL)—EXPRESSED IN DECIMALS OF AN INCH

Distance between bulkheads, baffles, or ring stiffeners			Volume capacity in gallons per inch											
			10 or less			Over 10 to 14			14 to 18			18 and over		
			MS	HSLA, SS	AL	MS	HSLA, SS	AL	MS	HSLA, SS	AL	MS	HSLA, SS	AL
Maximum shell radius	Less than 70 inches	36 inches or less.....	14	16	0.087	14	16	0.087	14	15	0.096	13	14	0.109
		Over 36 inches to 54 inches.....	14	16	.087	14	15	.096	13	14	.109	12	13	.130
		54 inches through 60 inches.....	14	15	.096	13	14	.109	12	13	.130	11	12	.151
	70 inches or more, less than 90 inches	36 inches or less.....	14	16	.087	14	15	.096	13	14	.109	12	13	.130
		Over 36 inches to 54 inches.....	14	15	.096	13	14	.109	12	13	.130	11	12	.151
		54 inches through 60 inches.....	13	14	.109	12	13	.130	11	12	.151	10	11	.173
	90 inches or more, less than 125 inches	36 inches or less.....	14	15	.096	13	14	.109	12	13	.130	11	12	.151
		Over 36 inches to 54 inches.....	13	14	.109	12	13	.130	11	12	.151	10	11	.173
		54 inches through 60 inches.....	12	13	.130	11	12	.151	10	11	.173	9	10	.194
	125 inches or more	36 inches or less.....	13	14	.109	12	13	.130	11	12	.151	10	11	.173
		Over 36 inches to 54 inches.....	12	13	.130	11	12	.151	10	11	.173	9	10	.194
		54 inches through 60 inches.....	11	12	.151	10	11	.173	9	10	.194	8	9	.216

(1) *Product density.* The material thicknesses contained in Tables I and II are minimums based on a maximum 7.2 pounds per gallon product weight. If the tank is designed to haul products weighing more than 7.2 pounds per gallon, the gallon per inch value used to determine the minimum thickness of heads, bulkheads, baffles or shell sheets shall be the actual section capacity required in gallons per inch multiplied by the actual product density in pounds per gallon divided by 7.2.

§ 178.341-3 Closures for fill openings and manholes.

(a) Each compartment in excess of 2,500 gallons capacity shall be accessible through a manhole of at least 11 x 15 inches. Manhole and/or fill opening covers shall be designed to provide secure closure of the openings. They shall have structural capability of withstanding internal fluid pressures of 9 p.s.i.g. without permanent deformation. Safety devices to prevent the manhole and/or fill cover from opening fully when internal pressure is present shall be provided.

§ 178.341-4 Vents.

(a) Each cargo tank compartment shall be provided with safety relief devices in accordance with the requirements contained in this paragraph. All of such devices shall communicate with the vapor space. Shutoff valves shall not be installed between the tank opening and any safety device. Safety relief devices shall be so mounted, shielded, or drained as to eliminate the accumulation of water, the freezing of which could impair the operation or discharge capability of the device.

(b) *Normal venting:* Each cargo tank compartment shall be provided with pressure and vacuum vents having a minimum through area of 0.44 square inch. All pressure vents shall be set to open at no more than 1 p.s.i.g. and all vacuum vents at no more than 6 ounces. Pressure and vacuum vents shall be designed to prevent loss of liquid through the vent in case of vehicle overturn.

(c) *Loading and unloading venting protection:* If the tank is designed to be loaded or unloaded with the dome cover closed, the vent or vents as described in paragraph (b) of this section or additional vents shall limit the vacuum to 1 p.s.i. and the tank pressure to 3 p.s.i.g.

based on maximum product transfer rate to be included on the metal certification plate § 178.340-10(b). Unless effective protection against overfilling is made, the pressure vent shall also have sufficient liquid capacity to prevent the pressure from exceeding 3 p.s.i.g. in case of accidental overfilling. This pressure vent may be pressure operated or interlocked with the tank loading device, and shall be designed to prevent loss of liquid through the vent under any condition of vehicle rollover attitude.

(d) *Emergency venting for fire exposure:*

(1) *Total capacity.* The total emergency venting capacity (cu. ft./hr.) of each cargo tank compartment shall be not less than that determined from Table III.

(2) *Pressure-actuated venting.* Each cargo tank compartment shall be equipped with pressure-actuated vent or vents set to open at not less than 3 p.s.i.g. and close when pressure drops to 3 p.s.i.g. or below. The minimum venting capacity for pressure-actuated vents shall be 6,000 cubic feet of free air per hour (14.7 p.s.i.a. and 60° F.) from a tank pressure of 5 p.s.i.g. Pressure-actuated devices shall be designed so as to prevent leakage of liquid past the device in case of surge or vehicle upset, except that they shall function in case of pressure rise under any condition of vehicle rollover attitude.

(3) *Fusible venting.* If the pressure-actuated venting required by subparagraph (2) of this paragraph does not provide the total venting capacity required by subparagraph (1) of this paragraph additional capacity shall be provided by adding fusible venting devices each having a minimum area of 1.25 square inches, such fusible elements shall be so located as to not be in contact with the tank lading under normal operating conditions. The fusible vent or vents shall be actuated by elements which operate at a temperature not exceeding 250° F. The venting capacity of these devices shall be rated at not more than 5 p.s.i.g.

(e) *Flow testing and marking of vents:* Each type and size of venting devices shall be flow tested in the ranges specified in the applicable preceding paragraphs. The actual rated flow capacity of the vent in cubic feet of free air per hour at the pressure in p.s.i.g. at which the flow capacity is determined shall be stamped on the device. The

TABLE III—MINIMUM EMERGENCY VENT CAPACITY IN CUBIC FEET; FREE AIR/HOUR (14.7 P.S.I.A. and 60° F.)

Exposed area square feet	Cubic feet free air per hour	Exposed area square feet	Cubic feet free air per hour
20	15,800	275	214,300
30	23,700	300	225,100
40	31,600	350	245,700
50	39,500	400	265,000
60	47,400	450	283,200
70	55,300	500	300,600
80	63,300	550	317,300
90	71,200	600	333,300
100	79,100	650	348,800
120	94,900	700	363,700
140	110,700	750	378,200
160	126,500	800	392,200
180	142,300	850	405,700
200	158,100	900	419,300
225	181,300	950	432,300
250	203,100	1,000	445,000

NOTE 1: Interpolate for intermediate sizes.

fusible vent or vents shall have their flow rating determined at 5 p.s.i.g. differential.

(1) These flow tests may be conducted by the manufacturer or may be delegated to a certified outside agency.

§ 178.341-5 Emergency flow control.

(a) Each product discharge opening shall be equipped with a self-closing shut off valve, designed, installed, and protected in accordance with § 178.340-8(d) and operated so as to assure against the accidental escape of contents. These valves shall be located inside the tank or at a point outside the tank where the line enters or leaves the tank. The valve seat shall be located inside the tank or within the welded flange, its companion flange, nozzle, or coupling. Such product discharge valves (outflow) shall, in addition to normal means, be closed by (1) an automatic heat actuated means which will become effective at a temperature not over 250° F., (2) a secondary closing means, remote from tank filling or discharge openings, for operation in event of fire or other accident.

§ 178.341-6 Gauging devices.

(a) No applicable provisions.

§ 178.341-7 Method of test.

(a) *Test for leaks.* Every cargo tank shall be tested by a minimum air or hy-

drostatic pressure of 3 p.s.i.g. or at least equal to the tank design pressure of § 178.341-1(b) whichever is greater applied to the whole tank and dome if it be noncompartmented. If compartmented each individual compartment shall be similarly tested with adjacent compartments empty and at atmospheric pressure. Air pressure, if used, shall be held for a period of at least 5 minutes during which the entire surface of all joints under pressure shall be coated with a solution of soap and water, heavy oil, or other material suitable for the purpose, foaming or bubbling of which indicates the presence of leaks. Hydrostatic pressure, if used, shall be done by using water or other liquid having a similar viscosity, the temperature of which shall not exceed 100° F. during the test, and applying pressure as prescribed above, gauged at the top of the tank, at which time all joints under pressure shall be inspected for the issuance of liquid to indicate leaks. All closures shall be in place while test by either method is made. During these tests, operative relief devices shall be clamped, plugged, or otherwise rendered inoperative; such clamps, plugs, and similar devices shall be removed immediately after the test is finished. Any leakage discovered by either of the methods above described, or by any other method, shall be deemed evidence of failure to meet the requirements of this specification. Tanks failing to pass this test shall be suitably repaired, and the above described tests shall be continued until no leaks are discovered, before any cargo tank is put into service.

(b) *Test for distortion or failure.* Every cargo tank shall be tested by pressures prescribed in paragraph (a) of this section and shall withstand such pressure without undue distortion, evidence of impending failure, or failure. Failure to meet this requirement shall be deemed as sufficient cause for rejection under this specification. If there is undue distortion, or if failure impends or occurs, the cargo tank shall not be placed in or returned to service unless an adequate repair is made. The adequacy of the repair shall be determined by the same method of test.

§ 178.342 Specification MC 307; cargo tanks.

§ 178.342-1 General requirements.

(a) Specification MC 307 cargo tanks must comply with the general design and construction requirements in § 178.340, in addition to the specific design requirements contained in this section.

(b) The design pressure (maximum allowable working pressure) of each cargo tank shall be not less than 25 p.s.i.g. For working pressures in excess of 50 p.s.i.g. the tank must be designed in accordance with the requirements of the ASME Code.

(c) Tanks shall be of circular cross-section.

§ 178.342-2 Thickness of shell, heads, bulkheads, and baffles.

(a) *Material thickness.* The minimum thicknesses of tank material authorized in § 178.340-3 shall be not less than those obtained by applying the fol-

lowing formulas nor less than those specified in Tables I and II below:

$$\text{Thickness of shell} = T_s = \frac{PD}{2SE_s}$$

$$\text{Thickness of heads} = T_h = \frac{0.885PL}{SE_h}$$

*For pressure on concave side only.

where:

T_s = Minimum thickness of shell material, exclusive of allowance for corrosion or other loadings.

T_h = Minimum thickness of head material, after forming, exclusive of allowance for corrosion and other loadings.

P = Design pressure, pounds per square inch.

D = Inside diameter of shell, inches.

L = Inside crown radius of head, inches.

S = Maximum allowable stress value, pounds per square inch—equals one-fourth of specified minimum ultimate tensile strength (one-fourth of aluminum alloy's annealed minimum ultimate strength).

E_s = Lowest efficiency of any longitudinal joint in shell (85 percent maximum).

E_h = Lowest efficiency of any joint in head (85 percent maximum).

TABLE I—MINIMUM THICKNESS OF HEADS, BULKHEADS, AND BAFFLES. MILD STEEL (MS), HIGH STRENGTH LOW ALLOY (HSLA), AND AUSTENITIC STAINLESS STEEL (SS) EXPRESSED IN U.S. GAUGE; ALUMINUM ALLOY (AL) IN DECIMALS OF AN INCH

	Volume capacity of tank in gallons per inch																				
	10 or less			Over 10 to 14			14 to 18			18 to 22			22 to 26			26 to 30			30 and over		
	MS	HSLA, SS	AL	MS	HSLA, SS	AL	MS	HSLA, SS	AL	MS	HSLA, SS	AL	MS	HSLA, SS	AL	MS	HSLA, SS	AL	MS	HSLA, SS	AL
Thickness.....	14	15	0.109	13	14	0.130	12	13	0.151	11	12	0.173	10	11	0.194	9	10	0.216	8	9	0.237

TABLE II—MINIMUM THICKNESS OF SHELL SHEETS. MILD STEEL (MS), HIGH STRENGTH LOW ALLOY (HSLA), AND AUSTENITIC STAINLESS STEEL (SS) EXPRESSED IN U.S. STANDARD GAUGE; ALUMINUM ALLOY (AL) IN DECIMALS OF AN INCH

	Volume capacity of tank in gallons per inch																				
	10 or less			Over 10 to 14			14 to 18			18 to 22			22 to 26			26 to 30			30 and over		
	MS	HSLA, SS	AL	MS	HSLA, SS	AL	MS	HSLA, SS	AL	MS	HSLA, SS	AL	MS	HSLA, SS	AL	MS	HSLA, SS	AL	MS	HSLA, SS	AL
Distance between bulkheads, baffles, or other shell stiffeners																					
Inches																					
36 or less.....	14	16	0.109	14	16	0.109	14	15	0.109	13	14	0.130	12	13	0.151	11	12	0.173	10	11	0.194
Over 36 to 54.....	14	16	.109	14	15	.109	13	14	.130	12	13	.151	11	12	.173	10	11	.194	9	10	.216
54 through 60.....	14	15	.109	13	14	.130	12	13	.151	11	12	.173	10	11	.194	9	10	.216	8	9	.237

(1) The knuckle radius of the head shall not be less than three times the material thickness. The straight flange shall not be less than three times the material thickness for butt-welded heads.

(2) For heads with pressure on the convex side, the material thickness as obtained by the above formula shall be increased by 67 percent unless such heads are adequately braced to prevent excessive distortion.

(b) *Corrosion allowance.* Vessels or part of vessels subject to thinning by corrosion, erosion, or mechanical abrasion, shall have provision made to withstand the intended life and service by a suitable increase in the thickness of the material over that determined by the design formulas, or by using some other suitable method of protection. Material added for these purposes need not be of the same thickness for all parts of the vessel if different rates of attack are expected for the various parts.

§ 178.342-3 Closures for manholes.

(a) Each compartment shall be accessible through a 15-inch minimum inside diameter manhole. The manhole cover shall be designed to provide a secure closure of the manhole. All joints between manhole covers and their seats shall be made tight against leakage of vapor and liquid. Gaskets, if used, shall be of suitable material not subject to attack by lading.

(1) Closures shall have structural capability of withstanding internal fluid pressures of 40 p.s.i.g. or 1.5 times the design pressure of the tank whichever is greater without permanent deformation. Safety devices to prevent the manhole and/or fill cover from opening fully when internal pressure is present shall be provided.

§ 178.342-4 Vents.

(a) Each cargo tank compartment shall be provided with safety relief devices in accordance with the requirements contained in this paragraph. All of such devices shall communicate with the vapor space. Shutoff valves shall not be installed between the tank opening and any safety device. Safety relief de-

vices shall be so mounted, shielded, or drained as to eliminate the accumulation of water, the freezing of which could impair the operation or discharge capability of the device.

(b) *Total capacity:* Every cargo tank compartment shall be provided with one or more devices with sufficient capacity to limit the tank internal pressure to a maximum of 130 percent of the tank design pressure. This total venting capacity shall be not less than that determined from Table III, using the external surface of the cargo tank or tank compartment as the exposed area.

(c) *Pressure-actuated venting (spring loaded):* Every cargo tank compartment shall be equipped with pressure-actuated vent or vents set to open at not less than the tank design pressure. The minimum venting capacity for pressure actuated vents shall be 12,000 cubic feet of free air per hour (14.7 p.s.i.a. and 60° F.) per compartment or 12,000 cubic feet of free air per hour (14.7 p.s.i.a. and 60° F.) for each 350 square feet of exposed tank area, whichever is greater. This minimum capacity shall be measured at a pressure of 130 percent of the tank design pressure. Pressure actuated devices shall be designed to function in case of pressure rise when in any condition of roll over attitude. If pressure (maximum limits to be included on the metal certification plate § 178.340-10 (b)) unloading devices are provided, the relief valve shall have sufficient capacity to limit the tank internal pressure to 130 percent of design pressure.

(d) *Fusible and frangible venting:* If the pressure-actuated venting required by paragraph (c) of this section does not provide the total venting capacity required by paragraph (b) of this section, additional capacity shall be provided by adding fusible and/or frangible venting devices. Each fusible device shall have a minimum area of 1.25 square inches and shall be actuated by elements which operate at a temperature not exceeding 250° F. when the tank pressure is between the tank design pressure and 130 percent of the tank design pressure. Such fusible elements shall be so located as to not be in contact with the lading under normal operating conditions. The bursting pressure of frangible devices shall be not less than 130

percent nor more than 150 percent of the tank design pressure.

TABLE III—MINIMUM EMERGENCY VENT CAPACITY IN CUBIC FEET; FREE AIR/HOUR (14.7 P.S.I.A. AND 60° F.)

Exposed area square feet	Cubic feet free air per hour	Exposed area square feet	Cubic feet free air per hour
20	15,800	275	214,300
30	23,700	300	225,100
40	31,600	350	245,700
50	39,500	400	265,000
60	47,400	450	283,200
70	55,300	500	300,600
80	63,300	550	317,300
90	71,200	600	333,300
100	79,100	650	348,800
120	94,900	700	363,700
140	110,700	750	378,200
160	126,500	800	392,200
180	142,300	850	405,900
200	158,100	900	419,300
225	191,300	950	432,300
250	203,100	1,000	445,000

NOTE 1: Interpolate for intermediate sizes.

(e) Flow testing and marking of vents: Each type and size of venting devices shall be flow tested in the ranges specified in the applicable preceding paragraphs. The actual rated flow capacity of the vent in cubic feet of free air per hour at the pressure in p.s.i.g. at which the flow capacity is determined shall be stamped on the device.

(1) These flow tests may be conducted by the manufacturer or may be delegated to a certified agency.

§ 178.342-5 Outlets.

(a) Each product discharge opening shall be equipped with a self-closing shut-off valve, designed, installed, and protected in accordance with § 178.340-8(d) and operated so as to assure against the accidental escape of contents. These valves shall be located inside the tank or within the welded flange, its companion flange, nozzle, or coupling. Such product discharge valves (outflow) shall, in addition to normal means, be closed by (1) an automatic heat actuated means which will become effective at a temperature not over 250° F., (2) a sec-

ondary closing means, remote from tank filling or discharge openings, for operation in event of fire or other accident.

(b) Vapor return lines, if used, may be equipped with an excess flow valve at the tank connection if a positive shutoff valve is provided between the excess-flow valve and the hose connection.

§ 178.342-6 Gauging devices.

(a) *Gauge device design.* Every tank compartment except tanks filled by weight, shall be equipped with one or more gauging devices which shall indicate accurately the maximum permitted liquid level in each compartment. Additional gauging devices may be installed but may not be used as primary controls for filling of cargo tanks at pressures above atmospheric. Acceptable gauging devices for use at pressures above atmospheric are the rotary tube, the adjustable slip tube and the fixed length dip tube. Gauge glasses are not permitted to be installed on any cargo tank.

(b) *Fixed level indicators.* All liquid level gauging devices, except those on tanks provided with fixed maximum level indicators, shall be legibly and permanently marked in increments of not more than 20° F. to indicate the maximum levels to which the tank may be filled with liquid at temperatures above 20° F. In the event that it is impractical to put these markings on the gauging device, this information shall be marked on a suitable plate affixed to the tank in a location adjacent to the gauging device.

(c) *Dip tubes.* A fixed length dip tube gauging device when used shall consist of a dip pipe of small diameter equipped with a valve at the outer end, and extending into the tank to a specified fixed length. On horizontally mounted cylindrical tanks, the fixed length to which the tube extends into the tank shall be such that the device will function to indicate when the liquid reaches the maximum level permitted by the regulations in this part.

§ 178.342-7 Method of test.

(a) *Test pressure.* The standard test pressure for each required test shall be

40 p.s.i.g. or a minimum of 1.5 times design pressure whichever is greater.

(b) *Method of test.* Every cargo tank shall be tested by complete filling (including domes if any) with water or other liquid having a similar viscosity and applying a pressure of not less than the standard test pressure specified in paragraph (a) of this section. The pressure shall be gauged at the top of the tank. The tank shall hold the prescribed pressure for at least 10 minutes. All tank accessories shall be leakage tested after installation and proved tight at not less than the design pressure of the tank, except that hose used on such tanks may be tested either before or after installation. Failure to successfully meet the test criteria shall be deemed evidence of failure to meet the requirements of this specification. Tanks failing to pass this test shall be suitably repaired. The suitability of the repair shall be determined by the same method of test.

(1) *When divided into compartments.* When the interior of the tank is divided into compartments, each compartment shall be tested as a separate tank with adjacent compartments empty and at atmospheric pressure.

§ 178.343 Specification MC 312; cargo tanks.

§ 178.343-1 General requirements.

(a) Specification MC 312 cargo tanks must comply with the general design and construction requirements in § 178.340 in addition to the specific requirements contained in this section.

(b) Tank design: Cargo tanks built under this specification that are unloaded by pressure in excess of 15 p.s.i.g. must be designed and constructed in accordance with and fulfill all requirements of the ASME Code. No tank shall have head, bulkhead, and baffle or shell thicknesses less than that specified in § 178.343-2, Tables I and II, nor shall the spacing of bulkheads, baffles, or shell stiffeners exceed that specified in § 178.340-7.

(c) Design pressure shall be not less than pressure used for unloading.

§ 178.343-2 Thickness of shell, heads, bulkheads, and baffles of non-ASME Code tanks.

(a) *Material thickness.* The minimum thicknesses of tank material authorized in § 178.340-3 shall be predicated on not exceeding the maximum allowable stress level in § 178.340-4(a) but in no case less than those indicated in Tables I and II listed below, or the accompanying aluminum alloy formula:

TABLE I—MINIMUM THICKNESS OF HEADS, BULKHEADS, AND BAFFLES. MILD STEEL (MS), HIGH STRENGTH LOW ALLOY STEEL (HSLA), AUSTENITIC STAINLESS STEEL (SS), IN U.S. STANDARD GAUGE—UNLESS OTHERWISE EXPRESSED IN FRACTIONS OF AN INCH

	Volume capacity in gallons per inch											
	10 or less			Over 10 to 14			14 to 18			18 and over		
	Product weight in pounds per gallon at 60° F.											
	10lbs. and less	Over 10 to 13lbs.	13 to 16lbs.	10lbs. and less	Over 10 to 13lbs.	13 to 16lbs.	10lbs. and less	Over 10 to 13lbs.	13 to 16lbs.	10lbs. and less	Over 10 to 13lbs.	13 to 16lbs.
Thickness.....	12	10	8	10	8	$\frac{3}{16}$	9	$\frac{3}{16}$	$\frac{1}{4}$	8	$\frac{1}{4}$	$\frac{1}{4}$

TABLE II—MINIMUM THICKNESS OF SHELL SHEETS. MILD STEEL (MS), HIGH STRENGTH LOW ALLOY STEEL (HSLA), AUSTENITIC STAINLESS STEEL (SS) IN U.S. STANDARD GAUGE—UNLESS OTHERWISE EXPRESSED IN FRACTIONS OF AN INCH

			Distance between bulkheads, baffles, or ring stiffeners	Volume capacity in gallons per inch											
				10 or less			Over 10 to 14			14 to 18			18 and over		
							Product weight in pounds per gallon at 60° F.								
				10lbs. and less	Over 10 to 13lbs.	13 to 16lbs.	10lbs. and less	Over 10 to 13lbs.	13 to 16lbs.	10lbs. and less	Over 10 to 13lbs.	13 to 16lbs.	10lbs. and less	Over 10 to 13lbs.	13 to 16lbs.
Maximum shell radius	Less than 70 inches	36 inches or less.....	12	10	8	12	10	8	12	10	8	10	8	3/16	
		Over 36 inches to 54 inches.....	12	10	8	12	10	8	10	8	3/16	9	3/16	1/4	
		54 inches through 60 inches.....	12	10	8	10	8	3/16	9	3/16	1/4	8	1/4	1/4	
	70 inches or more, less than 90 inches	36 inches or less.....	12	10	8	12	10	8	10	8	3/16	9	3/16	1/4	
		36 inches to 54 inches.....	12	10	8	10	8	3/16	9	3/16	1/4	8	1/4	1/4	
		54 inches through 60 inches.....	10	8	3/16	9	3/16	1/4	8	1/4	1/4	3/16	1/4	3/16	
	90 inches or more, less than 125 inches	36 inches or less.....	12	10	8	10	8	3/16	9	3/16	1/4	8	1/4	1/4	
		36 inches to 54 inches.....	10	8	3/16	9	3/16	1/4	8	1/4	1/4	3/16	1/4	3/16	
		54 inches through 60 inches.....	9	3/16	1/4	8	1/4	1/4	3/16	1/4	3/16	3/16	1/4	3/16	
	125 inches or more	36 inches or less.....	10	8	3/16	9	3/16	1/4	8	1/4	1/4	3/16	1/4	3/16	
		36 inches to 54 inches.....	9	3/16	1/4	8	1/4	1/4	3/16	1/4	3/16	3/16	1/4	3/16	
		54 inches through 60 inches.....	8	1/4	1/4	3/16	1/4	3/16	3/16	1/4	3/16	1/4	3/16	3/16	

(1) Aluminum alloy formula.

Thickness of aluminum alloy materials=Steel thickness from Tables I and IIX $\left(\frac{3 \times 10^7}{E}\right)^{1/2}$

where:

E=Modulus of elasticity of the material to be used.

(b) Lining. Except as provided in paragraph (c) of this section, cargo tanks shall be lined and the material used for lining each cargo tank subject to this specification shall be homogeneous, nonporous, imperforate when applied, not less elastic than the metal of the tank proper, and substantially immune to attack by the commodities to be transported therein. It shall be directly bonded or attached by other equally satisfactory means. Joints and seams in the lining shall be made by fusing the material together, or by other equally satisfactory means.

(c) Conditions under which tanks need not be lined. Tanks need not be lined as provided in paragraph (b) of this section, if:

(1) The material of the tank is substantially immune to attack by the materials to be transported therein; or,

(2) The material of the tank is thick enough to withstand 10 years normal service without being reduced at any point to less thickness than that speci-

fied in paragraph (a) of this section corresponding to its type; or,

(3) The chemical reaction between the material of the tank and the commodity to be transported therein is such as to allow the tank to be properly passivated or neutralized and if the tank is not frequently cleaned and not used in the transportation of other commodities.

§ 178.343-3 Closure for manholes.

(a) Each compartment shall be accessible through a 15-inch minimum inside diameter manhole. The manhole cover shall be designed to provide a secure closure of the manhole. All joints between manhole covers and their seats shall be made tight against leakage of vapor and liquid. Gaskets, if used, shall be of suitable material not subject to attack by the lading.

(1) The manhole cover shall have structural capability of withstanding internal fluid pressures equal to 1.5 times

the design pressure of the tank and in no case less than 15 p.s.i.g. without permanent deformation. Safety devices to prevent the manhole and/or fill cover from opening fully when internal pressure is present shall be provided.

§ 178.343-4 Vents.

(a) *Safety vent.* Every cargo tank compartment shall be equipped with suitable pressure relief devices as required by the ASME Code, or shall be fitted with suitable rupture discs in lieu of mechanical pressure relief valves. Such discs shall be designed to rupture at not to exceed 1.5 times the design pressure of the tank. If air inlet devices are provided a relief valve shall have adequate capacity to limit tank pressure to 130 percent of design pressure at maximum inlet flow rate. Such maximum limits to be included on the metal certification plate § 178.340-10(b). Air inlet lines if permanently connected to an air source shall be equipped with a check valve. Shutoff valves between the tank and relief valve or rupture disc are prohibited.

§ 178.343-5 Outlets.

(a) Each outlet at or near the top of a tank, used for discharge of lading, must be equipped with a shutoff valve located as close as practical to the point of outlet from the tank. Each such outlet having its discharge end below the top liquid level in the tank must be equipped with an additional shutoff valve, blank flange, or sealing cap at the discharge end of the outlet.

(b) Except as provided in paragraphs (c) and (d), of this section; each bottom outlet must be equipped with a shutoff valve designed, installed, and protected as follows:

(1) Product piping must be protected in such a manner as to reasonably assure against the accidental escape of contents. Such protection must be provided by:

(i) A shear section located out-board of each valve seat and within 4 inches of the vessel which will break under strain and leave the valve seat and its attachment to the vessel and the valve head intact and capable of retaining product. The shear section shall be machined in such a manner as to abruptly reduce the wall thickness of the adjacent piping

(or valve) material by at least 20 percent; or

(ii) By suitable guards capable of absorbing a concentrated horizontal force of at least 8,000 pounds applied from any horizontal direction, without damage to the discharge piping which will adversely affect the product retention integrity of the discharge valve.

(2) Each bottom outlet valve must be located inside the tank or immediately adjacent at the outlet point outside the tank.

(i) The valve seat must be located inside the tank or within the welded flange, its companion flange, nozzle, or coupling at the point of outlet from the tank.

(ii) Each bottom discharge valve must be equipped with a remote means to activate a valve closure manually from a point no less than 10 feet away.

(3) In addition, a blank flange, sealing cap, or shutoff valve is required at the discharge end of the outlet.

(c) A bottom opening for purposes other than lading discharge may be closed by a bolted blank flange at the tank shell. If any piping extends from such an opening, it must be fitted with a shutoff valve designed, installed, and protected as described in paragraph (b)(1) of this section. In addition a supplemental closure is required at the discharge end of this piping.

(d) Bottom outlet valves need not meet subparagraph (b)(2)(ii) of this section when the cargo tank is transporting a corrosive liquid containing solids in suspension in sufficient quantity that settling may form a layer of solid material that may interfere with sealing of the valve seat.

§ 178.343-6 Gauging devices.

(a) No applicable requirement.

§ 178.343-7 Method of test.

(a) *Test for leaks.* Every cargo tank shall be tested by completely filling the tank and dome with water or other liquid having a similar viscosity, the temperature of which shall not exceed 100° F. during the test, and applying a pressure of 1.5 times the design pressure but not less than 3 p.s.i.g. The pressure shall be gauged at the top of the tank. The tank shall hold the prescribed pressure for at

least 10 minutes without failure, undue distortion, leakage or evidence of impending failure. All closures shall be in place while test is made. During these tests, operative relief devices shall be clamped, plugged or otherwise rendered inoperative; such clamps, plugs, and similar devices shall be removed immediately after the test is finished.

(b) *Test for distortion or failure.* Every cargo tank shall be tested by the pressures prescribed in paragraph (a) of this section and shall withstand such pressures without undue distortion or other indication of impending failure. If there is undue distortion, or if failure impends or occurs, the cargo tank shall not be placed in or returned to service unless an adequate repair is made. The adequacy of the repair shall be determined by the same method of test.

(c) *Test of heating system.* After an interior heating system consisting of coil piping is installed, and before the tanks to which they are fitted are placed in service, the heating system shall be tested. Systems employing media such as steam or hot water under pressure for heating the contents of cargo tanks shall be tested with hydrostatic pressure and proved to be tight at 200 p.s.i.g.

(d) *When divided into compartments.* When the interior of the tank is divided

into compartments, each compartment shall be tested as a separate tank.

Subpart K—Specifications for General Packagings

§ 178.350 Specification 7A; general packaging, Type A.

§ 178.350-1 General requirements.

(a) Each packaging must meet all applicable requirements of § 173.24 of this chapter.

§ 178.350-2 Specific requirements.

(a) Each packaging must be so designed and constructed that it meets the standards for Type A packaging (see §§ 173.389(j) and 173.398(b) of this chapter).

§ 178.350-3 Marking.

(a) Marking on the outside of each packaging as follows: "USA DOT 7A Type A" and "Radioactive Material."

(b) The letter and number size and additional marking requirements of § 173.24 of this subchapter must be complied with.

APPENDICES TO PART 178

APPENDIX A—SPECIFICATIONS FOR STEEL

TABLE 1

Open-hearth, basic oxygen, or electric steel of uniform quality.
The following chemical composition limits are based on ladle analysis:

Designation	Chemical composition, percent-ladle analysis		
	Grade 1 ¹	Grade 2 ^{1 2}	Grade 3 ^{1 4 5}
Carbon.....	0.10/0.20.....	0.24 maximum.....	0.22 maximum.
Manganese.....	1.10/1.60.....	0.50/1.00.....	1.25 maximum.
Phosphorus, maximum.....	0.04.....	0.04.....	0.045. ³
Sulfur, maximum.....	0.05.....	0.05.....	0.05.
Silicon.....	0.15/0.30.....	0.30 maximum.....	
Copper, maximum.....	0.40.....		
Columbium.....		0.01/0.04.....	
Heat treatment authorized.....	(³).....	(³).....	(³).....
Maximum stress (p.s.i.).....	35,000.....	35,000.....	35,000.

¹ Addition of other elements to obtain alloying effect is not authorized.

² Ferritic grain size 6 or finer according to ASTM E112-63.

³ Any suitable heat treatment in excess of 1,100° F., except that liquid quenching is not permitted.

⁴ Other alloying elements may be added and shall be reported.

⁵ For compositions with a maximum carbon content of 0.15 percent on ladle analysis, the maximum limit for manganese on ladle analysis may be 1.40 percent.

⁶ Rephosphorized Grade 3 steels containing no more than 0.15 percent phosphorus are permitted if carbon content does not exceed 0.15 percent and manganese does not exceed 1 percent.

App. B

CHECK ANALYSIS TOLERANCES

A heat of steel made under any of the above grades, the ladle analysis of which is slightly out of the specified range is acceptable if the check analysis is within the following variations:

Element	Limit or maximum specified (percent)	Tolerance (percent) over the maximum limit or under the minimum limit	
		Under minimum limit	Over maximum limit
Carbon.....	To 0.15 inclusive.....	0.02	0.03
	Over 0.15 to 0.40 inclusive.....	0.03	0.04
Manganese.....	To 0.60 inclusive.....	0.03	0.03
	Over 0.60 to 1.15 inclusive.....	0.04	0.04
	Over 1.15 to 2.50 inclusive.....	0.05	0.05
Phosphorus ¹	All ranges.....		0.01
Sulfur.....	All ranges.....		0.01
Silicon.....	To 0.30 inclusive.....	0.02	0.03
	Over 0.30 to 1.00 inclusive.....	0.05	0.05
Copper.....	To 1.00 inclusive.....	0.03	0.03
	Over 1.00 to 2.00 inclusive.....	0.05	0.05
Nickel.....	To 1.00 inclusive.....	0.03	0.03
	Over 1.00 to 2.00 inclusive.....	0.05	0.05
Chromium.....	To 0.90 inclusive.....	0.03	0.03
	Over 0.90 to 2.10 inclusive.....	0.05	0.05
Molybdenum.....	To 0.20 inclusive.....	0.01	0.01
	Over 0.20 to 0.40 inclusive.....	0.02	0.02
Zirconium.....	All ranges.....	0.01	0.05
Columbium.....	To 0.04 inclusive.....	0.005	0.01
Aluminum.....	Over 0.10 to 0.20 inclusive.....	0.04	0.04
	Over 0.20 to 0.30 inclusive.....	0.05	0.05

¹ Rephosphorized steels not subject to check analysis for phosphorus.

APPENDIX B—SPECIFICATIONS FOR PLASTICS

TABLE I

Polyethylene must have the following properties, as determined by the American Society For Testing Materials (ASTM) methods designated. Tests must be performed on resin with additives included:

Property	Type I	Type II	Type III	ASTM method
Density, g./cc.....	0.910-0.926.....	0.926-0.941.....	0.941-0.965.....	D 1505-68.
Melt index (flow rate).....	2.0 max.....	1.0 max.....	1.0 max.....	D 1238-65T.
Tensile strength.....	1,500 p.s.i. min.....	1,800 p.s.i.....	3,000 p.s.i.....	D 638-68.
Elongation.....	400% min.....	400%.....	75%.....	D 638-68.

Other materials may be added to polyethylene resin provided they do not adversely affect the physical properties specified above.

PART 179—SPECIFICATIONS FOR TANK CAR TANKS

Subpart A—Introduction, Approvals and Reports

Sec.	
179.1	General.
179.2	Definitions and abbreviations.
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Subpart B—General Design Requirements

179.10	Tank mounting.
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Subpart E—Specifications for Multi-Unit Tank Car Tanks (Classes DOT-106A and 110AW)

179.300	General specifications applicable to multi-unit tank car tanks designed to be removed from car structure for filling and emptying (Classes DOT-106A and 110AW).
179.301	Individual specification requirements for multi-unit tank car tanks.
179.302	Special commodity requirements for multi-unit tank car tanks.

Subpart F—[Reserved]

Subpart A—Introduction, Approvals and Reports

§ 179.1 General.

(a) This Part prescribes the specifications for tanks that are to be mounted on a motor vehicle and which are used for the transportation of hazardous materials.

(b) Except as provided in paragraph (c) of this section, tanks to which this part is applicable, must be built to the specifications prescribed in this Part.

(c) Tanks built to specifications predating those in this part may continue in use as provided in § 173.31 of this subchapter.

(d) Any person who performs a function prescribed in this part, shall perform that function in accordance with this Part.

(e) When this Part requires a tank to be marked with DOT specification (for example, DOT-106A100W), compliance with that requirement is the responsibility of the tank builder. Marking the tank with the DOT specification shall be understood to certify compliance by the builder that the functions performed by the builder, as prescribed in this Part, have been performed in compliance with this Part.

(f) The tank builder should inform each person to whom that tank is transferred of any specification requirements which have not been met at time of transfer.

§ 179.2 Definitions and abbreviations.

(a) The following apply in Part 179:

(1) "AAR" means Association of American Railroads.

(2) "Approved" means approval by the AAR Committee on Tank Cars.

(3) "ASTM" means American Society for Testing and Materials.

(4) "Department" means the Illinois Department of Transportation.

(5) "DOT" means U.S. Department of Transportation.

(6) Definitions in Part 173 of this chapter also apply.

(7) "F" means degrees Fahrenheit.

(8) "NGT" means National Gas Taper Threads.

(9) "NPT" means American Standard Tapered Pipe Thread.

(10) "P.s.i.g." means pounds per square inch gauge.

(11) "Tanks" means tank car tanks.

§ 179.3 [Reserved]

§ 179.4 [Reserved]

§ 179.5 Certificate of construction.

(a) [Reserved]

(b) Before a tank of Class DOT-106A, or 110A is placed in service, the builder must furnish a Certificate of Construction, Form AAR 4-2 to the owner, in addition to a Certificate of Inspector's Report as required in § 179.300-20 in

prescribed form certifying that the tank and appurtenances comply with all the requirements of the specifications.

(c) If the owner elects to furnish the appurtenances such as valves and safety devices, the owner shall assure that the appurtenances comply with all the requirements of the specifications.

(d) When tanks which are covered on one application and are identical in all details are built in series, one certificate shall suffice for each series. One copy of the Certificate of Construction must be furnished to the owner for each tank number of consecutively numbered group or groups covered by the original application.

§ 179.6 Repairs and alterations.

For procedure to be followed in making repairs or alterations, see Appendix R of the AAR Specifications for Tank Cars.

Subpart B—General Design Requirements

§ 179.10 Tank mounting.

(a) The use of rivets to secure anchors to tanks prohibited.

§ 179.11 Welding certification.

(a) Welding procedures, welders and fabricators shall be approved.

§ 179.12 Interior heater systems.

§ 179.12-1 General.

(a) Interior heater systems shall be of approved design and materials. If a tank is divided into compartments, a separate system shall be provided for each compartment.

§ 179.12-2 Materials and dimensions.

(a) Interior heater systems and plug flanges, if welded to tank, shall be cast, forged or fabricated metal, and be of good weldable quality in conjunction with metal of tank.

(b) Piping must be not less than 2 inches IPS. Tubing must be not less than 2 $\frac{3}{8}$ inches outside diameter and the wall thickness must be at least equivalent to the corresponding pipe size. Material specifications and nominal wall thickness must be as follows:

Material	Nominal thickness minimum ¹		Specifications ASTM
	2 inches	Over 2 inches	
Carbon steel.....	0.175.....	Schedule 40.....	A53-69a, A192-69, A178-70.
Alloy steel.....	Schedule 40S.....	Schedule 40S.....	A312-70, A269-69.
Aluminum.....	Schedule 80.....	Schedule 80.....	B241-69, B210-70, B221-69.
Nickel.....	Schedule 40.....	Schedule 40.....	B161-70.

¹ Thickness must be increased 25 percent or to next higher schedule, whichever is less, when threaded joints are used.

(c) Systems may be fabricated of other materials and of other than circular cross section, if approved.

§ 179.12-3 Joints and fittings.

(a) Welded butt joints are preferable. Bolted joints with flange welded to piping may be used if welding is not feasible or to facilitate tank cleaning or application of linings. Return bends shall be forged, or made by bending the pipe. Cast, forged or fabricated manifolds of approved design may be used.

(b) Inlets and outlets of heater systems shall be equipped with valve cock, cap or plug. Caps and plugs shall be secured by chain.

§ 179.12-4 Application to tank.

(a) Interior heater systems shall be so constructed that the breaking off of their external connections will not cause leakage of contents of tank.

(b) Inlets and outlets may be located in any portion of shell, heads, or steam jacketed outlet provided proper drainage of heater system is accomplished.

(c) If ends of coils are not attached to a manifold or steam jacketed outlet, they shall be attached to pads or reinforcements. Such reinforcements must be attached to tank in compliance with the requirements of the tank specification.

(1) Outside pipe connections to steam coils shall not be an integral part of the interior coils and shall be screwed or

welded, or both, into outside of pads or reinforcements.

(d) All piping shall be secured so as to permit necessary expansion and contraction.

§ 179.12-5 Tests.

(a) Each interior heater system shall be hydrostatically tested at not less than 200 psi and shall hold the pressure for 10 minutes without leakage or evidence of distress.

§ 179.12-6 Reports.

(a) The Certificate of Construction for the completed car shall indicate installation of interior heater system and date of initial hydrostatic test.

§ 179.12-7 Stenciling.

(a) To indicate that tank is equipped with interior heater system, the tank, or the jacket if tank is insulated, shall be stenciled in compliance with the applicable requirements of AAR Specifications for Tank Cars, Appendix C.

§ 179.13 [Reserved]

§ 179.14 [Reserved]

Subpart C—[Reserved]

Subpart D—[Reserved]

Subpart E—Specifications for Multi-Unit Tank Car Tanks (Classes DOT-106A and 110AW)

§ 179.300 General specifications applicable to multi-unit tank car tanks designed to be removed from car structure for filling and emptying (Classes DOT-106A and 110AW).

§ 179.300-1 Tanks built under these specifications shall meet the requirements of § 179.300, § 179.301 and when applicable, § 179.302.

§ 179.300-2 [Reserved]

§ 179.300-3 Type and general requirements.

(a) Tanks built under this specification shall be cylindrical, circular in cross section, and shall have heads of ap-

proved design. All openings shall be located in the heads.

(b) Each tank shall have a water capacity of at least 1500 pounds and not more than 2600 pounds.

(c) For tanks made in foreign countries, a chemical analysis of materials and all tests as specified shall be carried out under the supervision of a competent and impartial inspector.

§ 179.300-4 Insulation.

(a) Tanks shall not be insulated.

§ 179.300-5 Bursting pressure.

(a) The minimum required bursting pressure is listed in § 179.301.

§ 179.300-6 Thickness of plates.

(a) For class DOT-110A tanks, the wall thickness after forming of the cylindrical portion of the tank must not be less than that specified in § 179.301 nor that calculated by the following formula:

$$t = \frac{Pd}{2SE}$$

where:

d =inside diameter in inches;

E =1.0 welded joint efficiency;

P =minimum required bursting pressure in p.s.i.;

S =minimum tensile strength of plate material in p.s.i. as prescribed § 179.300-7;

t =minimum thickness of plate material in inches after forming.

t =minimum design thickness of plate in inches.

(b) For class DOT-106A tanks, the wall thickness of the cylindrical portion of the tank shall not be less than that specified in § 179.301 and shall be such that at the tank test pressure the maximum fiber stress in the wall of the tank will not exceed 15,750 p.s.i. as calculated by the following formula:

$$s = \frac{p(1.3D^2 + 0.4d^2)}{D^2 - d^2}$$

where:

d =inside diameter in inches;

D =outside diameter in inches;

p =tank test pressure in p.s.i.;

s =wall stress in p.s.i.

(c) If plates are clad with material having tensile strength at least equal to the base plate, the cladding may be considered a part of the base plate when determining the thickness. If cladding material does not have tensile strength

at least equal to the base plate, the base plate alone shall meet the thickness requirements.

§ 179.300-7 Materials.

(a) Carbon steel plate material used to fabricate tanks having heads fusion welded to tank shell must comply with the following specifications with the indicated minimum tensile strength and elongation in the welded condition. The maximum allowable carbon content must be 0.31 percent when the individual specification allows carbon content greater than this amount. The plates may be clad with other approved materials:

Specifications	Minimum tensile strength (p.s.i.) welded condition ¹	Minimum elongation in 2 inches (percent) welded condition (longitudinal)
ASTM A 285-69 Gr. A.....	45,000	29
ASTM A 285-69 Gr. B.....	50,000	20
ASTM A 285-69 Gr. C.....	55,000	20
ASTM A 515-69 Gr. 65.....	65,000	20
ASTM A 515-69 Gr. 70.....	70,000	20

¹ Maximum stresses to be used in calculations.

(b) Carbon steel plate material used to fabricate tanks with forge welded heads must comply with the following specifications:

Specifications	Minimum tensile strength (p.s.i.) welded condition ¹	Minimum elongation in 2 inches (percent) welded condition (longitudinal)
ASTM A 285-69 Gr. A.....	45,000	29

¹ Maximum stresses to be used in calculations.

(c) All plates must have their heat number and the name or brand of the manufacturer legibly stamped on them at the rolling mill.

§ 179.300-8 Tank heads.

(a) Class DOT-110A tanks shall have fusion-welded heads formed concave to pressure. Heads for fusion welding shall be an ellipsoid of revolution 2:1 ratio of major to minor axis. They shall be one piece, hot formed in one heat so as to provide a straight flange at least 1½ inches long. The thickness shall not be less than that calculated by the following formula:

$$t = \frac{Pd}{2SE}$$

where symbols are as defined in § 179.300-6(a).

(b) Class DOT-106A tanks must have forged-welded heads, formed convex to pressure. Heads for forge welding must be torispherical with an inside radius not greater than the inside diameter of the shell. They must be one piece, hot formed in one heat so as to provide a straight flange at least 4 inches long. They must have snug drive fit into the shell for forge welding. The wall thickness after forming must be sufficient to meet the test requirements of § 179.300-16 and to provide for adequate threading of openings.

§ 179.300-9 Welding.

(a) Longitudinal joints must be fusion welded. Head-to-shell joints must be forge welded on class DOT-106A tanks and fusion welded on class DOT-110A tanks. Welding procedures, welders and fabricators must be approved in accordance with AAR Specifications for Tank Cars, Appendix W.

(b) Fusion-welded joints must be in compliance with the requirements of AAR Specifications for Tank Cars, Appendix W, except that circumferential welds in tanks less than 36 inches inside diameter need not be radiotaped.

(c) Forge-welded joints shall be thoroughly hammered or rolled to insure sound welds. The flanges of the heads shall be forge lapwelded to the shell and then crimped inwardly toward the center line at least one inch on the radius. Welding and crimping must be accomplished in one heat.

§ 179.300-10 Postweld heat treatment.

After welding is complete, steel tanks and all attachments welded thereto, must be postweld heat treated as a unit in compliance with the requirements of AAR Specifications for Tank Cars, Appendix W.

§ 179.300-11 Tank mounting.

(a) For tank mounting, see § 179.10.

§ 179.300-12 Protection of fittings.

(a) Tanks shall be of such design as will afford maximum protection to any fittings or attachment to the head including the housing referred to in § 179.300-12(b). Tank ends shall slope or curve inward toward the axis so that the diameter at each end is at least 2 inches less than the maximum diameter.

(b) Loading and unloading valves shall be protected by a detachable pro-

ective housing of approved design which shall not project beyond the end of the tank and shall be securely fastened to the tank head. Safety relief devices shall not be covered by the housing.

§ 179.300-13 Venting, loading and unloading valves.

(a) Valves shall be of approved type, made of metal not subject to rapid deterioration by lading, and shall withstand tank test pressure without leakage. The valves shall be screwed directly into or attached by other approved methods to one tank head. Provision shall be made for closing outlet connections of the valves.

(b) Threads for openings shall be National Gas Taper Threads (NGT) tapped to gage, clean cut, even and without checks.

§ 179.300-14 Attachments not otherwise specified.

Siphon pipes and their couplings on the inside of the tank head and lugs on the outside of the tank head for attaching the valve protective housing must be fusion-welded in place prior to postweld heat treatment. All other fixtures and appurtenances, except as specifically provided for, are prohibited.

§ 179.300-15 Safety relief devices.

(a) Unless prohibited in § 179.302, or in Part 173 of this chapter, tanks shall be equipped with one or more safety relief devices of approved type, made of metal not subject to rapid deterioration by the lading and screwed directly into tank heads or attached to tank heads by other approved methods. The total discharge capacity shall be sufficient to prevent building up pressure in tank in excess of 82.5 percent of the tank test pressure. When safety relief devices of the fusible plug type are used, the required discharge capacity shall be available in each head. See AAR Specifications for Tank Cars, Appendix A, for formula for calculating discharge capacity.

(b) Threads for openings shall be National Gas Taper Threads (NGT) tapped to gage, clean cut, even and without checks.

(c) Safety relief valves shall be set for start-to-discharge and frangible discs shall burst at a pressure not exceeding that specified in § 179.301.

(d) Fusible plugs shall function at a temperature not exceeding 175° F. and shall be vapor-tight at a temperature of not less than 130° F.

§ 179.300-16 Tests of tanks.

(a) After postweld heat treatment, tanks shall be subjected to hydrostatic expansion test in a water jacket, or by other approved methods. No tank shall have been subjected previously to internal pressure within 100 pounds of the test pressure. Each tank shall be tested to the pressure prescribed in § 179.301. Pressure shall be maintained for 30 seconds and sufficiently longer to insure complete expansion of tank. Pressure gage shall permit reading to accuracy of one percent. Expansion gage shall permit reading of total expansion to accuracy of one percent. Expansion shall be recorded in cubic centimeters.

(1) No leaks shall appear and permanent volumetric expansion shall not exceed 10 percent of total volumetric expansion at test pressure.

(b) After all fittings have been installed, each tank shall be subjected to interior air pressure test of at least 100 p.s.i. under conditions favorable to detection of any leakage. No leaks shall appear.

(c) Repairs of leaks detected in manufacture or in foregoing tests shall be made by the same process as employed in manufacture of tank. Caulking, soldering, or similar repairing is prohibited.

§ 179.300-17 Tests of safety relief devices.

(a) Each valve shall be tested by air or gas before being put into service. The valve shall open and be vapor-tight at the pressure prescribed in § 179.301.

(b) Frangible discs of safety vents must be tested as prescribed in AAR Specifications for Tank Cars, Appendix A, A5.03.

(c) For safety relief devices of the fusible plug type, a sample of the plug used shall function at the temperatures prescribed in § 179.300-15.

(d) The start-to-discharge and vapor-tight pressures shall not be affected by any auxiliary closure or other combination.

§ 179.300-18 Stamping.

(a) To certify that the tank complies with all specification requirements, each tank shall be plainly and permanently

stamped in letters and figures $\frac{3}{8}$ inch high into the metal of valve end chime as follows:

- (1) DOT Specification number.
- (2) Material and cladding material if any (immediately below the specification number).
- (3) Owner's or builder's identifying symbol and serial number (immediately below the material identification). The symbol shall be registered with the Bureau of Explosives, duplications are not authorized.
- (4) Inspector's official mark (immediately below the owner's or builder's symbol).
- (5) Date of original tank test (month and year, such as 1-64 for January 1964). This should be so placed that dates of subsequent tests may easily be added thereto.
- (6) Water capacity—0000 pounds.
- (b) A copy of the above stamping in letters and figures of the prescribed size stamped on a brass plate secured to one of the tank heads is authorized.

§ 179.300-19 Inspection.

(a) Tank shall be inspected within the United States by a competent and impartial inspector.

(b) The inspector shall carefully inspect all plates from which tanks are to be made and secure records certifying that plates comply with the specification. Plates which do not comply with § 179.300-7 shall be rejected.

(c) The inspector shall make such inspection as may be necessary to see that all the requirements of this specification, including markings, are fully complied with; shall see that the finished tanks are properly stress relieved and tested.

(d) The inspector shall stamp his official mark on each accepted tank as required in § 179.300-18, and render the report required in § 179.300-20.

§ 179.300-20 Reports.

(a) Before a tank is placed in service, the inspector shall furnish the builder and tank owner with a report in approved form certifying that the tank and its equipment comply with all the requirements of this specification.

(b) For builder's Certificate of Construction, see § 179.5 (b), (c), and (d).

§ 179.301 Individual specification requirements for multi-unit tank car tanks.

(a) In addition to § 179.300 the individual specification requirements are as follows:

DOT specifications	106A500-X	106A800-X	110A500-W	110A800-W	110A1000-W
Bursting pressure, psi (see § 179.300-5)...	None specified	None specified	1250	2000	2500
Minimum thickness shell, inches.....	$1\frac{1}{4}$ ₂	$1\frac{1}{4}$ ₆	$1\frac{1}{4}$ ₂	$1\frac{1}{4}$ ₂	$1\frac{1}{4}$ ₂
Test pressure psi (see § 179.300-16).....	500	800	500	800	1000
Safety relief devices psi (see § 179.300-15).....					
Start-to-discharge, or burst maximum p.s.i.....	375	600	375	600	700
Vapor-tight, minimum p.s.i.....	300	480	300	480	650

§ 179.302 Special commodity requirements for multi-unit tank car tanks.

(a) In addition to §§ 179.300 and 179.301, the following requirements are applicable:

Commodity	Safety relief device	Valve protective housing	Miscellaneous
Chlorine trifluoride.....	Prohibited ¹		
Chloropicrin.....	Prohibited ¹	Gas tight ²	
Hydrofluoric acid.....	Prohibited ¹	Gas tight ²	
Hydrogen sulfide.....	Fusible plugs required ⁷	Required ⁶	(9)
Methyl mercaptan.....	Prohibited ¹		
Nitric oxide.....	Prohibited ¹	Gas tight ²	
Nitrogen dioxide liquid.....	Prohibited ¹	Gas tight ²	
Nitrogen peroxide liquid.....	Prohibited ¹	Gas tight ²	
Nitrogen tetroxide liquid.....	Prohibited ¹	Gas tight ²	
Nitrogen tetroxide-nitric oxide mixtures.....	Prohibited ¹	Gas tight ²	
Nitrosyl chloride.....	Fusible plugs required		(4)
Phosgene.....	Prohibited ¹	Gas tight ²	
Titanium tetrachloride (anhydrous).....	Prohibited ¹		
Vinyl chloride.....			(3)
Vinyl methyl ether.....			(2)

¹ When safety relief devices are prohibited, containers may be equipped with solid steel plugs in the safety device openings.

² The detachable protective housing for the loading and unloading valves must withstand tank test pressure without leakages and must be approved by the Bureau of Explosives.

³ All parts of valves and safety relief devices in contact with the lading must be of a metal or other material, suitably treated if necessary, which will not cause formation of any acetylides.

⁴ Tanks for nitrosyl chloride must be nickel-clad.

⁵ Each valve outlet must be sealed by a threaded cap or a threaded solid plug.

⁶ Valves must be protected by a metal cover.

⁷ Safety relief devices for hydrogen sulfide must be of the fusible plug type utilizing a fusible alloy with yield temperature not over 170° F., nor less than 157° F. Each device must be resistant to extrusion of the fusible alloy and leak tight at 130° F.

SUBCHAPTER D-MOTOR CARRIER SAFETY REGULATIONS FOR TRANSPORTATION OF HAZARDOUS MATERIALS

Part 397-Driving and parking rules

Sec.	
397.1	Application of the rules in this Part.
397.2	[Reserved]
397.3	State and local laws, ordinances, and regulations.
397.5	Attendance and surveillance of motor vehicles.
397.7	Parking.
397.9	Routes.
397.11	Fires.
397.13	Smoking.
397.15	Fueling.
397.17	Tires.
397.19	Instructions and documents.
397.21	Marking of vehicles operated by private carriers.

Authority: Illinois Revised Statutes, Chapter 95 1/2, Paragraphs 700-4(a) and 700-9(a).

397.1 Application of the rules in this Part.

(a) Except as provided in paragraph (c) of this section, the rules in this Part apply to each motor carrier engaged in the

transportation of hazardous materials by a motor vehicle which must be marked or placarded in accordance with 177.823 of Subchapter C and to-

(1) Each officer or employee of the carrier who performs supervisory duties related to the transportation of hazardous materials; and

(2) Each person who operates or who is in charge of a motor vehicle containing hazardous materials.

(b) Each person designated in paragraph (a) of this section must know and obey the rules in this Part.

397.2 [Reserved]

397.3 State and local laws, ordinances, and regulations.

Every motor vehicle containing hazardous materials must be driven and parked in compliance with the laws, ordinances, and regulations of the jurisdiction in which it is being operated, unless, they are inconsistent with specific regulations of the Department which are applicable to the operation of that vehicle.

397.5 Attendance and surveillance of motor vehicles

(a) Except as provided in paragraph (b) of this section, a motor vehicle which contains Class A or Class B explosives must be attended at all times by its driver or a qualified representative of the motor carrier that operates it.

(b) The rules in paragraph (a) of this section do not apply to a motor vehicle which contains Class A or Class B explosives if all of the following conditions exist—

(1) The vehicle is located on the property of a motor carrier, on the property of a shipper or consignee of the explosives, in a safe haven, or, in the case of a vehicle containing 50 pounds or less of either Class A or Class B explosives, on a construction or survey site; and

(2) The lawful bailee of the explosives is aware of the nature of the explosives the vehicle contains and has been instructed in the procedures he must follow in emergencies; and

(3) The vehicle is within the bailee's unobstructed field of view or is located in a safe haven.

(c) A motor vehicle which contains hazardous materials other than Class A or Class B explosives and which is located on a public street or highway or the shoulder of a public highway must be attended by its driver. However, the vehicle need not be attended while its driver is performing duties which are incident and necessary to his duties as the operator of the vehicle.

(d) For purposes of this section—

(1) A motor vehicle is attended when the person in charge of the vehicle is on the vehicle, awake, and not in a sleeper berth, or is within 100 feet of the vehicle and has it within his unobstructed field of view.

(2) A qualified representative of a motor carrier is a person who—

(i) Has been designated by the carrier to attend the vehicle;

(ii) Is aware of the nature of the hazardous materials contained in the vehicle he attends;

(iii) Has been instructed in the procedures he must follow in emergencies; and

(iv) Is authorized to move the vehicle and has the means and ability to do so.

(3) A safe haven is an area specifically approved in writing by local, State, or Federal governmental authorities for

the parking of unattended vehicles containing Class A or Class B explosives.

(e) The rules in this section do not relieve a driver from any obligation imposed by law relating to the placing of warning devices when a motor vehicle is stopped on a public street or highway.

397.7 Parking

(a) A motor vehicle which contains Class A or Class B explosives must not be parked—

(1) On or within 5 feet of the traveled portion of a public street or highway;

(2) On private property (including premises of a fueling or eating facility) without the knowledge and consent of the person who is in charge of the property and who is aware of the nature of the hazardous materials the vehicle contains; or

(3) Within 300 feet of a bridge, tunnel, dwelling, building, or place where people work, congregate, or assemble, except for brief periods when the necessities of operation require the vehicle to be parked and make it impracticable to park the vehicle in any other place.

(b) A motor vehicle which contains hazardous materials other than Class A or Class B explosives must not be parked on or within five feet of the traveled portion of public street or highway except for brief periods when the necessities of operation require the vehicle to be parked and make it impracticable to park the vehicle in any other place.

397.9 Routes

(a) Unless there is no practicable alternative, a motor vehicle which contains hazardous materials must be operated over routes which do not go through or near heavily populated areas, places where crowds are assembled, tunnels, narrow streets, or alleys. Operating convenience is not a basis for determining whether it is practicable to operate a motor vehicle in accordance with this paragraph.

(b) Before a motor carrier requires or permits a motor vehicle containing Class A or Class B explosives to be operated, he must prepare a written plan of a route that complies with the rules in paragraph (a) of this section for that vehicle and must furnish a copy of the written plan to the driver. However, the driver may prepare the written plan as agent for the motor carrier when the driver begins his

trip at a location other than the carrier's terminal.

397.11 Fires

(a) A motor vehicle containing hazardous materials must not be operated near an open fire unless its driver has first taken precautions to ascertain that the vehicle can safely pass the fire without stopping.

(b) A motor vehicle containing hazardous materials must not be parked within 300 feet of an open fire.

397.13 Smoking

No person may smoke or carry a lighted cigarette, cigar, or pipe on or within 25 feet of—

(a) A motor vehicle which contains explosives, oxidizing materials, or flammable materials; or

(b) An empty tank motor vehicle which has been used to transport flammable liquids or gases and which, when so used, was required to be marked or placarded in accordance with the rules in 177.823 of these regulations.

397.15 Fueling

When a motor vehicle which contains hazardous materials is being fueled—

(a) Its engine must not be operating; and

(b) A person must be in control of the fueling process at the point where the fuel tank is filled.

397.17 Tires

(a) If a motor vehicle which contains hazardous materials is equipped with dual tires on any axle, its driver must stop the vehicle in a safe location at least once during each 2 hours or 100 miles of travel, whichever is less, and must examine its tires. The driver must also examine the vehicle's tires at the beginning of each trip and each time the vehicle is parked.

(b) If, as the result of an examination pursuant to paragraph (a) of this section, or otherwise, a tire is found to be flat, leaking, or improperly inflated, the driver must cause the tire to be repaired, replaced, or properly inflated before the vehicle is driven. However, the vehicle may be driven to the nearest safe place to perform the required repair, replacement,

or inflation.

(c) If, as the result of an examination pursuant to paragraph (a) of this section, or otherwise, a tire is found to be overheated, the driver shall immediately cause the overheated tire to be removed and placed at a safe distance from the vehicle. The driver shall not operate the vehicle until the cause of the overheating is corrected.

(d) Compliance with the rules in this section does not relieve a driver from the duty to comply with the rules in the Illinois Vehicle Code.

397.19 Instructions and documents

(a) A motor carrier that transports Class A or Class B explosives must furnish the driver of each motor vehicle in which the explosives are transported with the following documents:

(1) A copy of the rules in this part;

(2) A document containing instructions on procedures to be followed in the event of accident or delay. The documents must include the names and telephone numbers of persons (including representatives of carriers or shippers) to be contacted, the nature of the explosives being transported, and the precautions to be taken in emergencies such as fires, accidents, or leakages.

(b) A driver who receives documents in accordance with paragraph (a) of this section must sign a receipt for them. The Carrier shall retain the receipt in his files for 1 year.

(c) A driver of a motor vehicle which contains Class A or Class B explosives must have in his possession and be familiar with—

(1) The documents specified in paragraph (a) of this section;

(2) The documents specified in 177.817 of Subchapter C of these regulations; and

(3) The written route plan specified in 397.9 (b).

397.21 Marking of vehicles operated by private carriers

(a) General. A motor vehicle being operated by a private carrier of property must be marked as specified in paragraphs (b) and (c) of this section if that vehicle—

(1) Is transporting hazardous materials of a kind or quantity that require the vehicle to be marked or placarded in

accordance with 177.823 of Subchapter C of these regulations, and

(2) Is operating under its own power, either alone or in combination.

(b) Nature of marking. The marking must display the following information:

(1) The name or trade name of the private carrier operating the vehicle.

(2) The city or community in which the carrier maintains its principal office or in which the vehicle is customarily based.

(3) If the name of a person other than the operating carrier appears on the vehicle, the words "operated by" immediately preceding the information required by subparagraphs (1) and (2) of this paragraph.

Other identifying information may be

displayed on the vehicle if it is not inconsistent with the information required by this paragraph.

(c) Size, shape, location, and color of marking. The marking must—

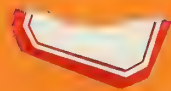
(1) Appear on both sides of the vehicle;

(2) Be in letters that contrast sharply in color with the background;

(3) Be readily legible during daylight hours from a distance of 50 feet while the vehicle is stationary; and

(4) Be kept and maintained in a manner that retains the legibility required by subparagraph (3) of this paragraph.

The marking may consist of a removable device if that device meets the identification and legibility requirements of this section.



DEPOSITORY

JUL 13 1983

CRIMINAL PENALTIES

UNIVERSITY OF ILLINOIS
AT URBANA-CHAMPAIGN

§ 107.371 CRIMINAL PENALTIES GENERALLY.

Section 12 of the Act provides a criminal penalty of a fine of not more than \$25,000 for any person who willfully violates a provision of the Act or a regulation issued under the Act.

§ 107.373 REFERRAL FOR PROSECUTION.

If the Department becomes aware of a possible willful violation of the Act, or any provision of the regulations, the Department reports it to the Department's Office of Chief Counsel. If appropriate, the Chief Counsel refers the report to the Attorney General or State's Attorney for criminal prosecution of the offender.

APPENDIX A

STANDARD CONDITIONS APPLICABLE TO EXEMPTIONS PACKAGES, CONTAINERS, SHIPMENTS

Exemptions from the regulations governing packages, containers, and the preparation and offering of hazardous materials for shipment are subject to the following conditions:

(1) The outside of each package must be plainly and durably marked "DOT-E or IDOT-E," as appropriate, followed by the exemption number assigned. On portable tanks, cargo tanks and tank car tanks, the markings must be in letters at least two inches high on a contrasting background.

(2) Each shipping paper issued in connection with a shipment made under an exemption must, in association with the entries required by §172.203(a), bear the notation "DOT-E or IDOT-E," as appropriate, followed by the exemption number assigned.

(3) When an exemption issued to a shipper contains special carrier requirements, the shipper shall furnish a copy of the exemption to the carrier before or at the time a shipment is tendered.

PARTS 108 - 169 (RESERVED)

SUBCHAPTER C-HAZARDOUS MATERIALS REGULATIONS

PART 170 (RESERVED)

PART 171 GENERAL INFORMATION, REGULATIONS, AND DEFINITIONS

Sec.

- 171.1 Purpose and scope.
- 171.2 General transportation requirements.
- 171.3 Hazardous Waste
- 171.4-171.5 (Reserved)
- 171.6 Agricultural exception.
- 171.7 Matter incorporated by reference.
- 171.8 Definitions and abbreviations.
- 171.9 Rules of construction.
- 171.10 (Reserved)
- 171.11 (Reserved)
- 171.12 Import and export shipments.
- 171.13 (Reserved)
- 171.14 Specification markings.
- 171.15 Notification and reporting of hazardous materials incidents.
- 171.16 (Reserved)
- 171.17 Hazardous substance discharge notification.
- 171.18 Continuation of effectiveness of existing Bureau of Explosives registrations.
- 171.19 Approvals or authorizations issued by the Bureau of Explosives.

Authority: Illinois Revised Statutes, Chapter 95 1/2, Paragraphs 700-4(a) and 700-9(a).

(Source: 7 Ill. Reg 3486, effective April 2, 1983)

§ 171.1 PURPOSE AND SCOPE.

This subchapter and subchapter D prescribe the requirements of the Illinois Department of Transportation governing the transportation of hazardous materials by highway within the State of Illinois.

(Source: 17 Ill. Reg 4287, effective April 16, 1982)

§ 171.2 GENERAL TRANSPORTATION REQUIREMENTS.

(a) Except as provided in § 171.12, and paragraphs (d) and (e) of this section, no person may offer or accept a hazardous material for transportation by highway in Illinois in a quantity that would require placarding under Subpart F of Part 172 of this subchapter, unless that material is properly classed, described, packaged, marked, labeled, placarded and in the condition for shipment as required by this subchapter and subchapter D.

(b) Except as provided in § 171.12, and paragraphs (d) and (e) of this section, no person may accept for transportation or transport a hazardous material by highway in Illinois in a quantity that would require placarding under Subpart F of Part 172 of this subchapter, unless that material is handled and transported in accordance with this subchapter and subchapter D.

(c) No person may offer, accept, or transport a hazardous material by highway in Illinois, regardless of the quantity of hazardous material in the shipment or on the vehicle, if that material poses an imminent danger to the public. The State Police are authorized to stop any vehicle that constitutes an imminent danger. For the purpose of this section, an imminent danger exists if, in the opinion of the State Police officer or the representative of the Department at the scene, the offer, acceptance, or transportation of that hazardous material is likely to cause death, serious illness, or severe personal injury.

ILLINOIS HAZARDOUS MATERIALS TRANSPORTATION REGULATIONS

(d) Except as provided in § 171.12, no person may offer or accept for transportation, or transport any quantity of radioactive material by highway in Illinois unless that material is properly classed, described, packaged, marked, labeled, placarded, handled and transported in accordance with this subchapter and subchapter D.

(e) No person may offer or accept for transportation or transport any quantity of a material classified by these regulations as an ORM-E [§ 173.500 (b)(5)] unless that material is prepared for shipment and packaged in accordance with and as required by these regulations.

(Source: 7 Ill. Reg 3486, effective April 2, 1983)

§ 171.3 HAZARDOUS WASTE.

(a) No person may offer for transportation or transport a hazardous waste (as defined in § 171.8 of this subchapter) by highway in Illinois except in accordance with the requirements of this subchapter.

(b) No person may accept for transportation, transport, or deliver a hazardous waste for which a manifest is required unless that person-

(1) Has marked each motor vehicle used to transport hazardous waste in accordance with § 397.21 of this title or 49 CFR § 1058.2 even though placards may not be required;

(2) Complies with the requirement for manifests set forth in § 172.205 of this subchapter; and

(3) Delivers, as designated on the manifest by the generator, the entire quantity of the waste received from the generator or a transporter to-

(i) The designated facility or, if not possible, to the designated alternate facility;

(ii) The designated subsequent carrier; or

(iii) A designated place outside the United States.

(c) If a discharge of hazardous waste or other hazardous material occurs during transportation, and an official of a State or local government or a Federal agency, acting within the scope of his official responsibilities, determines that immediate removal of the waste is necessary to prevent further consequence, that official may authorize the removal of the waste without the preparation of a manifest.

(d) If a hazardous material that is a hazardous waste is required by this subchapter to be shipped in a closed head DOT specification drum, and the hazardous waste contains solids or semisolids that would make its placement in a closed head drum impracticable (e.g., a drum with a 2.3 inch bung opening), an equivalent specification open head drum (except for closure) may be used for such a waste.

(Source: 7 Ill. Reg 3486, effective April 2, 1983)

§ 171.4 - 171.5 (RESERVED).

§ 171.6 AGRICULTURAL EXCEPTION.

(a) These regulations do not apply to the transportation of those hazardous materials cited below when such commodities are transported from retailer to final agricultural end user, or between final end users from farm to farm in approved containers and in the amounts and manner specified:

(1) Agricultural pesticides classified as Class B Poison or Flammable by these regulations, when moved in quantities of 5,000 pounds or less (aggregate gross weight) or 500 gallons or less volume in solution;

(2) Gasoline, diesel fuels, oils, lubricants, and liquefied petroleum gas when moved in quantities of 3,000 gallons or less and properly placarded in accordance with § 172.504(a).

(3) Ammonium nitrate fertilizer when moved in quantities of 16,000 pounds (aggregate gross weight) or less.

(4) Anhydrous ammonia when transported in a cargo tank (commonly known as a nurse tank and considered an implement of husbandry) operated by private carriers exclusively for agricultural purposes, provided the cargo tank:

(i) Has a minimum design pressure of 250 p.s.i. and meets the requirements of the ASME code in effect at time of manufacture and is marked accordingly;

(ii) Is equipped with safety relief valves meeting the requirements of CGA Pamphlet S1.2;

(iii) Is painted white or aluminum;

- (iv) Has a capacity of 1,500 gallons or less;
- (v) Is loaded to a filling density of 56 percent of water density (85 percent of volume capacity);
- (vi) Is drawn as a loaded, single unit trailer at speeds not to exceed 25 m.p.h. and is appropriately marked with a slow-moving-vehicle sign, except that two empty trailers (carrying tanks containing less than 25 percent of each tank's volume capacity) may be pulled in tandem;
- (vii) Is operated on a public highway only during daylight hours;
- (viii) Is moving anhydrous ammonia from retail to final agricultural end user or between final end users from farm to farm;
- (ix) Is marked on each side and on the rear of the container with the words "Caution - Ammonia" on a background of sharply contrasting colors in letters at least 4 inches high, or in lieu of the foregoing markings is placarded on each side and each end with non-flammable gas placards meeting the requirements of § 172.528 of these regulations.

§ 171.7 MATTER INCORPORATED BY REFERENCE.

(a) There is incorporated by reference in these regulations all matter referred to that is not specifically set forth. These materials are hereby made a part of these regulations. Unless the reference provides otherwise, matter subject to change is incorporated only as it is in effect on the date of issuance of the regulation referring to that matter.

(b) Whenever these regulations reference the Code of Federal Regulations and that reference incorporates the federal regulations into these regulations so as to make the federal regulations a part of these regulations, the federal regulations shall be considered to be incorporated into these regulations only so far as the federal regulation was in effect as of March 1, 1983, or the effective date of the section of these regulations referencing that federal regulation, whichever date is later in time.

(c) Matter incorporated by reference is available for distribution as follows:

- (1) ASME: American Society of Mechanical Engineers, United Engineering Center, 345 East 47th Street, New York, N.Y. 10017.
- (2) American National Standard: American National Standards Institute, Inc., 1430 Broadway, New York, N.Y. 10018.
- (3) CGA: Compressed Gas Association, Inc., 500 Fifth Avenue, New York, N.Y. 10036.
- (4) Bureau of Explosives: Bureau of Explosives, Association of American Railroads, American Railroads Building, 1920 L Street NW., Washington, D.C. 20036.
- (5) AAR: Association of American Railroads, 59 East Van Buren Street, Chicago, Ill. 60605.
- (6) ASTM: American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pa. 19103.
- (7) API: American Petroleum Institute, 1801 K Street NW., Washington, D.C. 20006.
- (8) AISI: American Iron and Steel Institute, 1000 16th Street NW., Washington, D.C. 20036.
- (9) The Chlorine Institute, 342 Madison Avenue, New York, N.Y. 10017.
- (10) MCA: Manufacturers' Association, Inc., 1825 Connecticut Avenue, NW., Washington, D.C. 20009.
- (11) NFPA: National Fire Protection Association, 60 Batterymarch Street, Boston, Mass. 02110.
- (12) Aluminum Association: The Aluminum Association, 420 Lexington Avenue, New York, N.Y. 10017.
- (13) NACE: National Association of Corrosion Engineers, 2400 West Loop South, Houston, TX 77027.
- (14) IME: Institute of Makers of Explosives, 420 Lexington Avenue, New York, N.Y. 10017.
- (15) IAEA: International Atomic Energy Agency, Karnter Ring 11, Post Office Box 590, A-1011, Vienna, Austria (IAEA publications may be purchased in the United States from Unipub, Inc., Post Office Box 433, New York, N.Y. 10016).
- (16) USD OE: U.S. Department of Energy Washington, D.C. 20545. Regulations of the USD OE are available from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Other publications by the USD OE may be obtained from the National Technical Information Center, U.S. Department of Commerce, Springfield, Va. 22151.

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- (17) Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.
- (18) National Wooden Box Association, Post Office Box 1010, Cumberland, Maryland 21502.
- (19) TFI: The Fertilizer Institute, 1015 18th Street N.W., Washington, D.C. 20036.
- (20) AWWA: American Water Works Association, 2 Park Avenue, New York, New York 10016.
- (21) AWS: American Welding Society, 345 East 47th Street, New York, New York 10016.
- (22) USDC: U.S. Department of Commerce, National Technical Information Service, 5285 Port Royal Road, Springfield, Virginia 22151.
- (23) Inter-governmental Maritime Consultative Organization, 101-104 Piccadilly, London, W1V 0AE, England.
- (24) Uniform Classification Committee, 222 South Riverside Plaza, Chicago, Ill. 60606.
- (25) USERDA: United States Energy Research and Development Administration, Washington, D.C. 20545.
- (26) USNRC: United State Nuclear Regulatory Commission, Washington, D.C. 20555.
- (27) UN: United Nations: United Nations Sales Section, New York, New York 10017
- (28) OPPSD: Organic Peroxide Producers' Safety Division, Society of the Plastic Industries, Inc., 355 Lexington Avenue, New York, N.Y. 10017.
- (29) ISO: International Organization for Standardization, Case Postale 56, CH-1211 Geneva 20, Switzerland. Also available from the American National Standards Institute, Inc., 1430 Broadway, New York, N.Y. 10018.
- (d) The full title and application of the matter incorporated by reference in Parts 170-179 and 397 of these regulations are as follows:
 - (1) ASME Code means sections VIII (Division 1) and IX of the 1977 edition of the "American Society of Mechanical Engineers Boiler and Pressure Vessel Code," and addenda thereto through December 31, 1978, except paragraph UW-11(a)(7) of the code does not apply.
 - (2) AAR Specifications for Tank Cars means the 1970 edition of the "Association of American Railroads Specification for Tank Cars".
 - (3) Compressed Gas Association:
 - (i) CGA Pamphlet C-3 is titled, "Standards for Welding and Brazing on Thin Walled Containers," 1975 edition;
 - (ii) CGA Pamphlet C-6 is titled, "Standards for Visual Inspection of Compressed Gas Cylinders," 1975 edition;
 - (iii) Compressed Gas Association Pamphlet C-7, Appendix A is titled, "A Guide for the Precautionary Markings for Compressed Gas Containers", dated May 15, 1971, Addenda issued January 1976.
 - (iv) CGA Pamphlet C-8 is titled, "Standard for Requalification of DOT-3HT Cylinders," 1972 edition.
 - (v) CGA Pamphlet S-1.2 is titled, "Safety Relief Device Standards Part 2-Cargo and Portable Tanks for Compressed Gases," 1966 edition.
 - (vi) CGA Pamphlet S-1.1 is titled, "Pressure Relief Device Standards Part 1-Cylinders for Compressed Gases," 1979 edition.
 - (vii) CGA Pamphlet C-12 is titled, "Qualification Procedure for Acetylene Cylinder Design," 1979 edition.
 - (viii) CGA Pamphlet C-14 is titled "Procedures for Fire Testing of DOT Cylinder Pressure Relief Device Systems," 1979 edition.
 - (4) American National Standards:
 - (i) American National Standard B9.1, is titled, "Safety Code for Mechanical Refrigeration," 1964 edition.
 - (ii) American National Standard B16.5 is titled, "Steel Pipe Flanges and Fittings," 1968 edition.
 - (iii) American National Standard N14.1 is titled, "Packaging of Uranium Hexafluoride for Transport," 1971 edition.
 - (5) American Society for Testing and Materials:
 - (i) ASTM D1310 is titled, "Standard Method of Test for Flash Point of Volatile Flammable Materials by Tag Open-Cup Apparatus," 1967 edition;
 - (ii) ASTM D323 is titled, "Test for Vapor Pressure of Petroleum Products (Reid Method)," 1968 edition.

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(iii) ASTM D1056 is titled, "Sponge and Expanded Cellular Rubber Products, Spec. and Tests for," 1968 edition.

(iv) ASTM G 23-69¹ is titled, "Standard Recommended Practice for Operating Light-and Water-Exposure Apparatus (Carbon-Arc Type) for Exposure of Nonmetallic Materials," 1969 edition (reapproved 1975).

(v) ASTM G 26-70¹ is titled, "Standard Recommended Practice for Operating Light-and Water-Exposure Apparatus (Xenon-Arc Type) for Exposure of Nonmetallic Materials," 1970 edition.

(vi) ASTM D-638¹ is titled, "Test for Tensile Strength of Plastics," 1976 edition.

(vii) ASTM D-1505¹ is titled, "Test for Density of Plastics by the Density Gradient Technique," 1968 edition.

(viii) ASTM C148-77 is titled, "Standard Methods of Polariscopic Examination of Glass Containers," 1977 edition.

(ix) ASTM E487-74 is titled, "Standard Test Method for Constant-Temperature Stability of Chemical Materials," 1974 edition.

(6) NFPA Pamphlet No. 58 is titled, "Standard for the Storage and Handling of Liquefied Petroleum Gases," 1972 edition.

(7) Bureau of Explosives, Association of American Railroads:

(i) Bureau of Explosives Pamphlet No. 6 is titled, "Illustrating Methods for Loading and Bracing Carload and Less Than Carload Shipments of Explosives and Other Dangerous Articles," 1962 edition.

(ii) Bureau of Explosives Pamphlet No. 6A (includes Appendix No. 1, October 1944, and Appendix No. 2, December 1945) is titled, "Illustrating Methods for Loading and Bracing Carload and Less Than Carload Shipments of Loaded Projectiles, Loaded Bombs, etc.," 1943 edition.

(iii) Bureau of Explosives Pamphlet No. 6C is titled, "Illustrating Methods for Loading and Bracing Trailers and Less Than Trailer Shipments of Explosives and other Dangerous Articles via Trailer-on-Flat-Car (TOFC) or Container-on-Flat-Car (COFC)," September 1968.

(iv) Bureau of Explosives Pamphlets 1 and 2 titled, "Emergency Handling of Hazardous Materials in Surface Transportation," June 1973.

(8) NACE Standard TM-01-69 is titled, "Test Method Laboratory Corrosion Testing of Metals for the Process Industries," 1969 edition.

(9) IME Standard 22 is titled, "IME Standard for the Safe Transportation of Class C Detonators (Blasting Caps) in a Vehicle With Certain Other Explosives," revised March 21, 1979 (IME Safety Library Publication No. 22).

(10) IAEA "Regulations for the Safe Transport of Radioactive Materials," 1967 edition and 1973 Revised edition, Safety Series, No. 6.

(11) United States Nuclear Regulatory Commission (USNRC).

(i) Title 10, Code of Federal Regulations, Part 71 is titled, "Packaging of Radioactive Materials for Transport and Transportation of Radioactive Materials Under Certain Conditions."

(12) U.S. Department of Commerce, National Bureau of Standards Handbook H28 (1957) - Part II is titled "Screw-Thread Standards for Federal Services 1957," December 1966 edition.

(13) National Wooden Box Association's Specification 1-1B is titled "Specifications for Nailed Wooden and Lock Corner Boxes for Industrial Use" May 1958. Amended in part October 1961.

(14) American Water Works Association (AWWA) Standard C207-55 is titled, "AWWA Standard for Steel Pipe Flanges," 1955 edition.

(15) American Welding Society (AWS):

(i) AWS Code B-3.0 is titled, "Standard Qualification Procedure," 1972 edition.

(ii) AWS Code D-1.0 is titled, "Code for Welding in Building Construction," 1966 edition.

(16) USDC, CAPE-1662, one of the series of "Civilian Applications Program Engineering Drawings" which is a package of information including drawings and bills of material, describing phenolic-foam insulated, protective overpacks.

¹ Available from American Society for Testing and Materials, 1916 Race St., Philadelphia, Pa. 19103.

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(i) USDC, USDOE Material and Equipment Specification No. SP-9, Rev. 1, is titled, "Fire Resistant Phenolic Foam."

(ii) USDC, ORO-651 is titled, "Uranium Hexafluoride Handling Procedures and Container Criteria," Revision 3, 1972 edition.

(17) "International Maritime Dangerous Goods Code," (IMCO code) Volumes I, II, III and IV, 1977 edition, and Amendments 14-76 and 15-77, 16-78, 17-79 and 18-79 thereto.

(18) "Uniform Freight Classification 11."

(19) General Services Administration, Federal Specification RR-C-901b. is titled, "Cylinders, Compressed Gas: With Valve or Plug and Cap; ICC 3AA," August 1, 1967.

(20) NIOSH Registry is titled, "Registry of Toxic Effects of Chemical Substances," 1978 edition, available from the Superintendent of Documents.

(21) United Nations Recommendations (UN Recommendations) is titled, "Transport of Dangerous Goods (1977)."

(22) SADT is titled, "Self Accelerating Decomposition Temperature Test," published by the OPPSD.

(23) "ISO 82-1974(e) Steel-Tensile Testing," First Edition 1974-08-01.

(Source: 7 Ill. Reg 3486, effective April 2, 1983)

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§ 171.8 DEFINITIONS AND ABBREVIATIONS.

In this subchapter,

"Approved" means approval issued or recognized by the Department unless otherwise specifically indicated in this subchapter.

"Associate Director for OE" means Associate Director for the Office of Operations and Enforcement, U.S. Department of Transportation, Washington, D.C. 20590.

"Bottle" means a container having a neck of relatively smaller cross section than the body and an opening capable of holding a closure for retention of the contents.

"Break-bulk" means packages of hazardous materials that are handled individually, palletized, or unitized for purposes of transportation as opposed to bulk and containerized freight.

"Bureau of Explosives" means the Bureau of Explosives (B of E) of the Association of American Railroads.

"C" means Celsius or Centigrade.

"Cargo tank" means any tank permanently attached to or forming a part of any motor vehicle or any bulk liquid or compressed gas packaging not permanently attached to any motor vehicle which by reason of its size, construction, or attachment to a motor vehicle, is loaded or unloaded without being removed from the motor vehicle. Any packaging fabricated under specifications for cylinders is not a cargo tank.

"Carrier" means a person engaged in the transportation of passengers or property by highway.

"CC" means closed-cup.

"Class A explosives" See § 173.53.

"Class B explosives" See § 173.88.

"Class C explosives" See § 173.100.

"COFC" means container-on-flat-car.

"Combustible liquid" See § 173.115.

"Compressed gas" See § 173.300.

"Consumer commodity" means a material that is packaged and distributed in a form intended or suitable for sale through retail sales agencies or instrumentalities for consumption by individuals for purposes of personal care or household use. This term also includes drugs and medicines.

"Corrosive material" See § 173.240.

"Cylinder" means a pressure vessel designed for pressures higher than 40 psia and having a circular cross section. It does not include a portable tank, multi-unit tank car tank, cargo tank, or tank car.

"Department" means the Illinois Department of Transportation.

"DOD" means the U.S. Department of Defense.

"Designated facility" means a hazardous waste treatment, storage, or disposal facility that has been designated on the manifest by the generator.

"EPA" means U.S. Environmental Protection Agency.

"Etiologic agent" See § 173.386.

"F" means degree Fahrenheit.

"Federal Hazardous Materials Regulations" means those regulations promulgated by the U.S. Department of Transportation for governing the transportation of hazardous materials by all modes of transportation and covered under Parts 100-199 of Title 49 of the Code of Federal Regulations.

"Flammable gas" See § 173.300(b).

"Flammable liquid" See § 173.115(a)(1).

"Flammable solid" See § 173.150.

"Flash point" means the minimum temperature at which a substance gives off flammable vapors which in contact with spark or flame will ignite. For liquids, see § 173.115 and for solids, see § 173.150.

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"Freight container" means a reusable container having a volume of 64 cubic feet or more, designed and constructed to permit being lifted with its contents intact and intended primarily for containment of packages (in unit form) during transportation.

"Fuel tank" means a tank other than a cargo tank, used to transport flammable or combustible liquid, or compressed gas for the purpose of supplying fuel for propulsion of the transport vehicle to which it is attached, or for the operation of other equipment on the transport vehicle.

"Full load" applies only to radioactive materials. See § 173.389 of this subchapter for its definition.

"Gross weight" means the weight of a packaging plus the weight of its contents.

"Hazardous material" means a substance or material which has been determined by the Secretary of the U. S. Department of Transportation to be capable of posing an unreasonable risk to health, safety, and property when transported, and which has been so designated.

"Hazardous substance", for the purposes of this subchapter, means a material, and its mixtures or solutions, that is identified by the letter "E" in Column 1 of the Table to § 172.101 when offered for transportation in one package, or in one transport vehicle if not packaged, and when the quantity of the material therein equals or exceeds the reportable quantity (RQ). This definition does not apply to petroleum products that are lubricants or fuels, or to a mixture or solution containing a material identified by the letter "E" in Column 1 of the Table to § 172.101 if it is in a concentration less than that shown in the following table based on the reportable quantity (RQ) specified for the materials in Column 2 of the Table to § 172.101.

RQ pounds	RQ kilograms	Concentration by weight	
		Percent	PPM
5000.....	2270	10	100,000
1000.....	454	2	20,000
100.....	45.4	0.2	2,000
10.....	4.54	0.02	200
1.....	0.45	0.002	20

"Hazardous waste", for the purposes of this subchapter, means any material that is subject to the hazardous waste manifest requirements of the EPA specified in 40 CFR Part 262 or would be subject to these requirements absent an interim authorization to a state under 40 CFR Part 123, Subpart F.

"Hermetically sealed" means closed by fusion, gasketing, crimping, or equivalent means so that no gas or vapor can enter or escape.

"The Illinois Vehicle Code" means the pertinent provisions of Chapter 95 1/2 of the Illinois Revised Statutes as now or hereafter amended.

"IM Tank Table" means the table (with preface) listing hazardous materials approved by the Associate Director of HMR for carriage in IM portable tanks under special conditions specified therein.

"IMCO" means Inter-governmental Maritime Consultative Organization.

"Intermodal container" means a freight container designed and constructed to permit it to be used interchangeably in two or more modes of transport.

"Intermodal portable tank" or "IM portable tank" means a specific class of portable tanks designed primarily for international intermodal use.

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"Irritating material" See § 173.381.

"Limited quantity," when specified as such in a section applicable to a particular material with the exception of Poison B materials, means the maximum amount of a hazardous material for which there is a specific labeling and packaging exception.

"Marking" means applying the descriptive name, instructions, cautions, weight, or specification marks or combination thereof required by this subchapter to be placed upon outside containers of hazardous materials.

"Mixture" means a material composed of more than one chemical compound or element.

"Mode" means any of the following transportation methods; rail, highway, air, or water.

"Motor vehicle" includes a vehicle, machine, tractor, trailer, or semitrailer, or any combination thereof, propelled or drawn by mechanical power and used upon the highways in the transportation of passengers or property. It does not include a vehicle, locomotive, or car operated exclusively on a rail or rails, or a trolley bus operated by electric power derived from a fixed overhead wire, furnishing local passenger transportation similar to street-railway service.

"MTB" means the Materials Transportation Bureau, U.S. Department of Transportation, Washington, D.C. 20590.

"MTB-TSC" means the Transportation Systems Center, Cambridge, Mass. 02142 (for functions performed under the direction and supervision of the MTB).

"Name of contents" means the proper shipping name as specified in § 172.101 or 49 CFR § 172.102 (when authorized).

"Net weight" means a measure of weight referring only to the contents of a package, and does not include the weight of any packaging material.

"N.O.S." means not otherwise specified.

"NRC (non-reusable container)" means a container whose reuse is restricted in accordance with the provisions of § 173.28.

"Operator" means a person who controls the use of an aircraft, vessel, or vehicle.

"Organic peroxide" See § 173.151.

"ORM" means Other Regulated Materials.

"Outage" or "ullage" means the amount by which a packaging falls short of being liquid full, usually expressed in percent by volume.

"Outside container" means the outermost enclosure used in transporting a hazardous material other than a freight container.

"Overpack" means an enclosure not intended for reuse that is used by a single consignor to consolidate two or more packages for convenience in handling.

"Oxidizer" or "Oxidizing material" See § 173.151.

"Package" or "Outside Package" means a packaging plus its contents.

"Packaging" means the assembly of one or more containers and any other components necessary to assure compliance with the minimum packaging requirements of this subchapter and includes containers (other than freight containers or overpacks), portable tanks, cargo tanks, tank cars, and multi-unit tank car tanks.

"Person" means any natural person or individual, governmental body, firm, association, partnership, copartnership, joint venture, company, corporation, joint stock company, trust, estate or any other legal entity or their legal representative, agent or assigns.

"Poison A" See § 173.326.

"Poison B" See § 173.343.

"Portable tank" means any packaging (except a cylinder having a 1000 pound or less water capacity) over 110 U.S. gallons capacity and designed primarily to be loaded into or on or temporarily attached to a transport vehicle or ship, and equipped with skids, mounting, or accessories to facilitate handling of the tank by mechanical means. It does not include any cargo tank, tank car tank, tank of the DOT-106A or 110A type, or trailers carrying 3AX, 3AAX, or 3T cylinders.

"Proper shipping name" means the name of the hazardous material shown in Roman print (not italics) in § 172.101 of this subchapter.

"P.s.i." or "psi" means pounds per square inch.

"P.s.i.a. or psia" means pounds per square inch absolute.

"P.s.i.g. or psig" means pounds per square inch gauge.

"Pyrophoric liquid" See § 173.115.

"Pyrophoric solid" See § 173.150.

"Radioactive materials" See § 173.389.

"Reportable quantity (RQ)" for the purposes of this subchapter means the quantity specified in Column 2 of the Table to § 172.101, for any material identified by the letter "E" in Column 1.

"Secretary of State" means the Secretary of State of Illinois.

"Sheathing" means a covering consisting of a smooth layer of wood placed over metal and secured to prevent any movement.

"Shipping paper" means a shipping order, bill of lading, manifest or other shipping document serving a similar purpose and containing the information required by §§ 172.202, 172.203 and 172.204.

"STC (single-trip container)" means a container that may not be refilled and reshipped after having been previously emptied, except as provided in § 173.28.

"Solution" means any homogeneous liquid mixture of two or more chemical compounds or elements that will not undergo any segregation under conditions normal to transportation.

"Spontaneously combustible material (solid)" means a solid substance (including sludges and pastes) which may undergo spontaneous heating or self-ignition under conditions normally incident to transportation or which may upon contact with the atmosphere undergo an increase in temperature and ignite.

"Strong outside container" means the outermost enclosure which provides protection against the unintentional release of its contents under conditions normally incident to transportation.

"Technical name" means a recognized chemical name currently used in scientific and technical handbooks, journals, and texts. Generic descriptions authorized for use as technical names are, Organic phosphate compound, Organic phosphorus compound, Organic phosphate compound mixture, Organic phosphorus compound mixture, Methyl parathion, and Parathion.

"TOFC" means trailer-on-flat-car.

"Transport vehicle" means a motor vehicle or rail car used for the transportation of cargo by any mode. Each cargo-carrying body (trailer, railroad freight car, etc.) is a separate transport vehicle.

"UFC" means Uniform Freight Classification.

"United States" means the fifty States, the District of Columbia, the Commonwealth of Puerto Rico, the Virgin Islands, American Samoa, or Guam.

"Viscous liquid" means a liquid material which has a measured viscosity in excess of 2500 centistokes at 25° C. (77° F.) when determined in accordance with the procedures specified in ASTM Method D 445-72 "Kinematic Viscosity of Transparent and Opaque Liquids (and the Calculation of Dynamic Viscosity)" or ASTM Method D 1200-70 "Viscosity of Paints, Varnishes, and Lacquers by Ford Viscosity Cup."

"Volatility" refers to the relative rate of evaporation of materials to assume the vapor state.

"Water reactive material (solid)" means any solid substance (including sludges and pastes) which, by interaction with water, is likely to become spontaneously flammable or to give off flammable or toxic gases in dangerous quantities.

"Water resistant" means having a degree of resistance to permeability by and damage caused by water in liquid form.

"W.T." means watertight.

§ 171.9 RULES OF CONSTRUCTION.

- (a) In these regulations, unless the context requires otherwise:
- (1) Words imparting the singular include the plural;
 - (2) Words imparting the plural include the singular; and
 - (3) Words imparting the masculine gender include the feminine;
- (b) In these regulations, the word:
- (1) "Shall" is used in an imperative sense;
 - (2) "Must" is used in an imperative sense;
 - (3) "Should" is used in a recommendatory sense;
 - (4) "May" is used in a permissive sense to state authority or permission to do the act described, and the words "no person may * * *" or "a person may not * * *" means that no person is required, authorized, or permitted to the act described; and
 - (5) "Includes" is used as a word of inclusion not limitation.

(Source: 17 Ill. Reg 4287, effective April 16, 1982)

§ 171.10 (RESERVED)**§ 171.11 (RESERVED)****§ 171.12 IMPORT AND EXPORT SHIPMENTS.**

(a) Except in the case of a shipment from Canada conforming to § 173.8, each person importing a hazardous material into the United States shall provide the shipper and the forwarding agent at the place of entry into the United States timely and complete information as to the requirements of this subchapter that will apply to the shipment of the material within the United States. The shipper, directly or through the forwarding agent at the place of entry, shall provide the initial carrier in the United States the certificate of compliance required by § 172.204. The carrier may not accept the material for transportation unless the required certification is provided.

(b) Except for Class A and Class B explosives and radioactive materials, a hazardous material which is classed and labeled in accordance with the conditions and limitations specified in § 172.102 of this subchapter when being imported into or exported from the United States, or passing through the United States in the course of being shipped between places outside the United States, may be offered and accepted for transportation and transported within the United States if it is otherwise offered, accepted, and transported in accordance with this subchapter.

In addition, an appropriate shipping name specified for a material in 49 CFR § 172.102 may be substituted for its proper shipping name in § 171.101 of this subchapter (subject to the conditions and limitations of this paragraph and 49 CFR § 172.102) if all or a portion of the transportation of the material is by vessel.

(c) The requirements of § 171.2 with respect to specification identification markings on packages notwithstanding, a package of hazardous materials (other than a compressed gas cylinder or a package of more than 110 gallons capacity) being imported into or exported from the United States or passing through the United States in the course of being shipped between places outside the United States may be offered and accepted for transportation and transported within the United States if the package specification identification markings required by Part 178 are clearly and legibly displayed on the surface of the package or on decals or tags securely affixed to the package, and the package is otherwise offered, accepted, and transported in accordance with this subchapter.

(d) Section 171.2 notwithstanding, a hazardous material (other than Class A or B explosives or radioactive materials) being imported into or exported from the United States or passing through the United States in the course of being shipped between places outside the United States may be offered and accepted for transportation and transported by motor vehicle within a single port area (including contiguous harbors) when packaged, marked, classed and labeled in accordance with the IMCO Code, if the hazardous material is offered and accepted in accordance with the requirements of Subparts C and F of Part 172 of this subchapter pertaining to shipping papers and placarding.

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